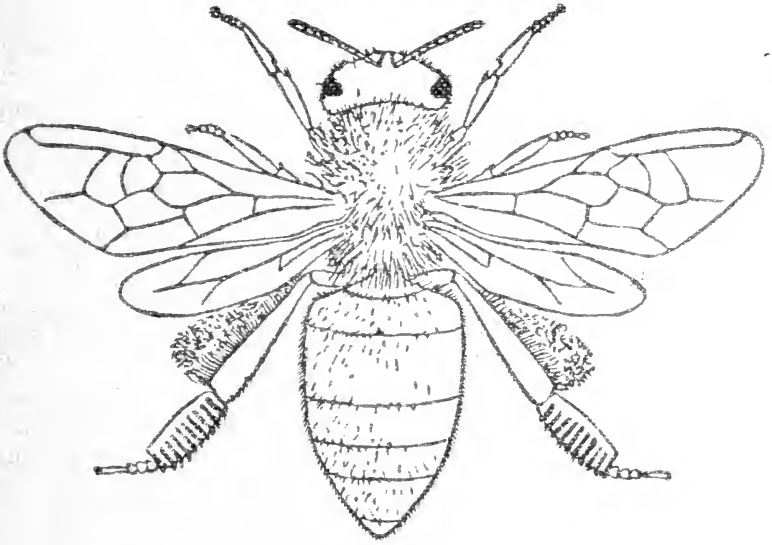
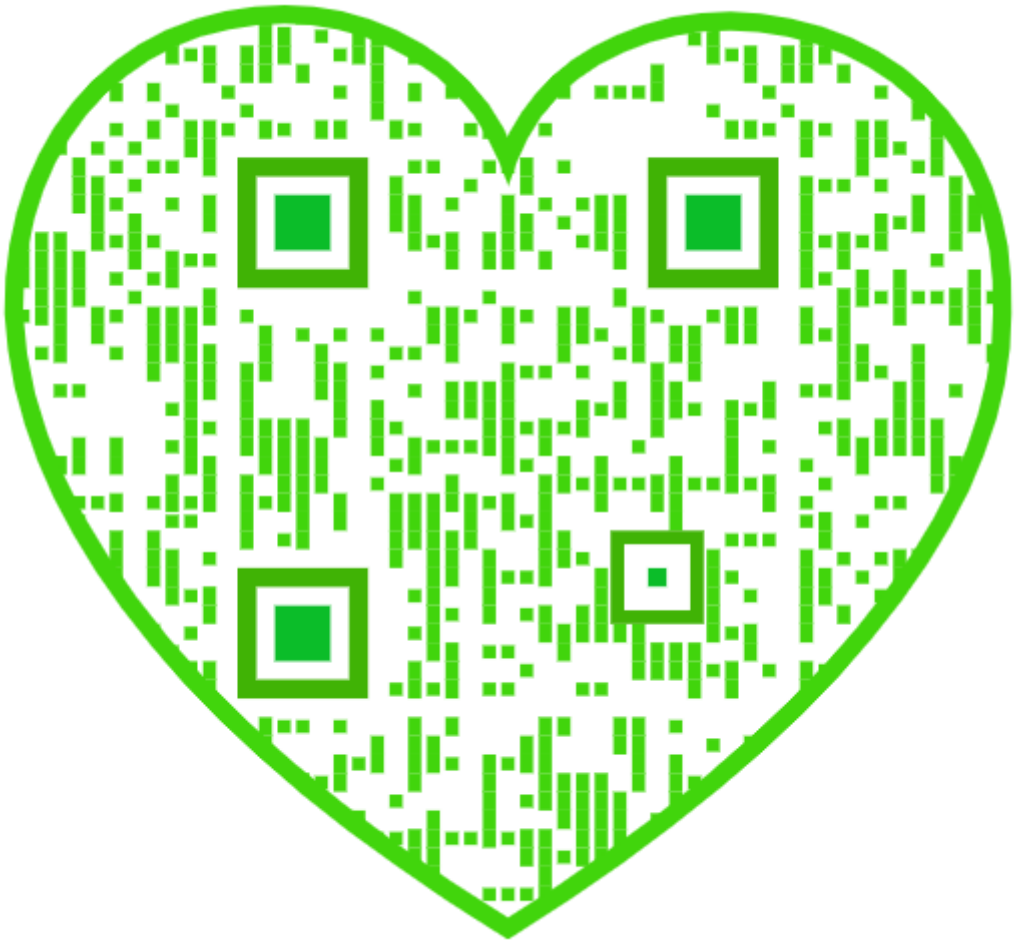
BEGINNER'S BEE BOOK

FRANK C. PELLETT





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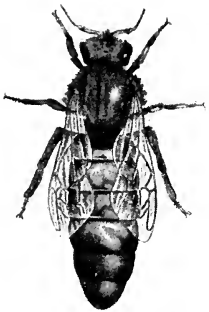

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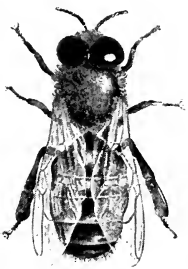

Drone

Worker

ITALIAN BEES

BEGINNER'S BEE BOOK

BY

FRANK C. PELLETT

ASSOCIATE EDITOR AMERICAN BEE JOURNAL, FORMER STATE APIARIST OF IOWA; AUTHOR "PRODUCTIVE BEEKEEPING," "PRACTICAL QUEEN REARING," ETC.

ILLUSTRATED

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PREFACE

In writing this book the author has answered such questions as are put to him in the hundreds of letters that come to his desk from every part of our own country and from many foreign lands. There is a constantly increasing interest in beekeeping. Men and women in large numbers are looking to beekeeping as a possible source of livelihood, while others find an interesting diversion from routine duties with a few colonies of bees. The novice wants a book that covers the fundamental without going too much into detail regarding the various systems of honey production. This book is designed to meet such a need, and does not pretend to cover the whole field of beekeeping. The business is too complicated to make possible anything more than a casual introduction in a book of this size. Those who desire to make a more extended study, will find " Productive

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Beekeeping," by the same author, or some similar book, of assistance in pursuing the subject further.

It has been the author's aim to set down only such facts as will be of practical value to the beginning beekeeper in producing and marketing honey. The author has had practical experience in the commercial production of honey. His work as State Apiarist of Iowa and as Associate Editor of *The American Bee Journal,* has given him opportunity to visit many of the most extensive beekeepers in the United States and Canada, and to observe the various systems of honey production which are profitably followed. Nothing is included here which it is not believed will stand the test of general usage under a variety of conditions.

FRANK C. PELLETT.

HAMILTON ILLINOIS,
April, 1919.

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BEGINNER'S BEE BOOK

CHAPTER I

ATTRACTIONS OF BEEKEEPING

BEEKEEPERS as a class are very enthusiastic about their occupation. The successful beekeeper who is not an enthusiast is an exception and there is no class which welcomes new recruits more warmly or gives the secrets of the business more freely. One who having once attended a typical convention of beekeepers, or a field day, does not feel something of this animated interest commonly spoken of as "bee fever," is never likely to become a honey producer.

Beekeeping has some decided advantages over poultry, gardening, fruit growing, or other light occupations often spoken of as in the same class. The first advantage is that no spe-

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cial situation is necessary. If the bees are within flying distance of nectar-producing flowers they can be kept almost anywhere. It is surprising in what unpromising places bees are to be found. An occasional hive will be found in the attic with an opening through a window sash, or on the roof when there is no more convenient place for them. Roof apiaries are not uncommon in the cities. The author has visited many back lot apiaries in various cities and has found that many of them are the source of several hundred dollars of yearly revenue. By placing the bees at the back end of the lot and facing the entrances away from the street there is seldom complaint of annoyance of neighbors, especially when a gentle strain of Italian bees is kept.

Another great advantage of beekeeping lies in the fact that one can so plan his work that a day's absence from home does not result in disaster or inconvenience. In fact, at some sea-

sons of the year, the bees need little attention for days or weeks at a time. Poultry must be fed daily, while the bees gather their own food. Business or professional men or women who are looking for a light occupation to take them into the open air will find just the thing in caring for a few bees. On stormy days when it is unpleasant to go out, the bees are better for being undisturbed. The work is mostly clean and light, just the kind of work that should engage the attention of one who is tired from office work.

The product of the apiary is ready to serve when it is taken from the hive and needs no special preparation on the part of the housewife. This fact is too often overlooked in comparing the price of honey with other foodstuffs. If the housewife who buys the family groceries will take account of all the time spent in preparing fruits, vegetables, etc., for the table and add the cost of fuel for cooking them, she will

find that honey is a very economical food to serve as frequently as her family can enjoy it.

THE BUSY BEES.—The activities of the bees are sufficient in themselves to attract many people, even though there was no profit to be made from the production of honey. On bright days when one most enjoys being in the open air, the bees are tremendously active. There will be a great bustle and hurry about the hive that makes one feel like sitting in the grass and watching them for hours at a time. There is something of mystery, also, in the little community where many thousand active little creatures live together in perfect harmony, all bent on the one aim of piling up as much honey as possible while the nectar is abundant in the fields. When the workers are no longer of use to the community they receive no consideration from their busy sisters, but are permitted to drag themselves off to die alone. If they are slow about leaving the hive they are often

dragged out, as there is no place for the decrepit and the infirm in the economy of the bee. When the season is over the drones are no longer likely to be useful in the fertilization of virgin queens, they are also driven out without mercy to die of cold or hunger in the open air. On chill autumn days little groups of disconsolate drones huddled together beside the hive are a common sight. When they are no longer permitted to return to the warmth of the cluster they gather into little bunches to get such comfort as they can from each other.

While we may not be pleased with their conduct toward the helpless members of the community, we cannot but admire the singleness of purpose with which they pursue their daily activities. Seldom do we find a student of nature but sooner or later becomes interested in bees and since there is so much to be learned concerning them it is usually a lifelong attraction.

Beekeeping for Women.—The woman who keeps bees does not have problems that are essentially different from those which confront a man. Many women are engaged in honey production successfully, and while there is some work for which she is not physically adapted, such as putting the bees into the cellar, where they are wintered in that way, it is usually possible to have such heavy work done by men or boys.

Beekeeping can be developed to occupy one's entire time for the year or merely the summer season, as best suits one's inclination and opportunity.

CHAPTER II

OUTLOOK FOR BEEKEEPING

THE outlook for beekeeping was never better than it is now. Greater prosperity for an agricultural specialty has always come with its general development over a large scope of country. This has been notably true of the dairy industry which formerly returned but a small part of the revenue that it does to-day.

Beekeeping as a business is very new, so new in fact that many people do not yet realize that beekeeping offers an opportunity as an exclusive occupation. It is only within the past half century that honey production has become commercially possible and but a very few years have passed since the first agricultural college established beekeeping as a regular part of its curriculum. Within the recent months many

more agricultural colleges have added this subject to their regular work.

The total output of the apiaries of the entire country probably does not amount to more than a pound or two of honey per capita for the population of the country, while many times the amount of sugar is consumed by the public. This fact should offer assurance that there is no immediate danger of over-production if the beekeepers use good business methods in the development of markets.

Food Value of Honey.—In a recent bulletin by the Food and Dairy Department of Iowa, it has been shown that for actual food value, honey is one of the cheapest of foods. While with most foods, a large part of the bulk is waste which adds neither fuel to warm the body nor rebuilds dead tissue, the bees have removed most of the waste from honey, so that it is nearly all consumed within the body. When its actual food and fuel value is considered, it is

shown to be a low-priced product, rather than a luxury as it is generally regarded. The following table shows the comparative value of several common commodities at pre-war prices as shown by the bulletin above mentioned.

At average prices:

Honey, 7 ounces	7 cents
Milk, 1 quart	10 cents
Cream cheese, 5.6 ounces	9 cents
Eggs, 10	25 cents
Round beefsteak, 12 ounces	15 cents
Boneless codfish, 15 ounces	20 cents
Oranges, 8	20 cents
Walnuts, 8½ ounces	13 cents

It will be noticed that for actual food and fuel value, honey is the cheapest food in the list. The table is designed to show a quantity of each article exactly equal in such value to any one of the others shown. Prices have since greatly changed.

If the beekeepers will use diligence in laying these facts before the public there will shortly be no lack of demand for the product of the hive. Most people like honey, but for some

reason its use has been neglected by many, who have substituted the cheaper corn syrups so widely advertised. When it is considered that these low-priced substitutes are low in sweetening value and also injurious to the digestive system, it will only require that the public be informed of the facts to restore honey to its former popularity as a food product.

The establishment of courses in beekeeping in so many agricultural colleges will tend to popularize its use, since its merits will be investigated and made known by the domestic science departments as well as apiculturalists.

Beekeeping a Specialty.—Beekeeping is becoming more and more a specialty. While there are still thousands of professional people who keep a few bees as a diversion, the bees under the apple tree on the general farm are becoming fewer every year. The spread of disease is largely responsible for this condition. While it is not difficult for the well-trained bee-

keeper to deal with bee diseases, bees that receive no attention, other than to give them a super for surplus in the spring and to remove it in the fall, sooner or later fall victims to adverse conditions.

While beekeeping is not difficult, bees can never be profitable without intelligent attention. Those who are devoting their attention to bee culture are receiving as large returns as those who follow other agricultural specialties and the work is no more trying nor is the risk any greater.

In few localities are there bees enough to gather the nectar in the fields, most of which now goes to waste. While good bee pasture is not plentiful in an occasional limited locality, there are many places where commercial orchardists are offering some inducement for beekeepers to locate within reach of their orchards, because of the better fruit crops that will result from the increased number of insects

among the blossoms. There are untold hundreds of good locations that will support profitable apiaries in any one of several of the northern states and perhaps as good openings in many of the southern states. In only a few states has beekeeping been commercially specialized, although the development bids fair to be much more rapid in the very near future.

Possible Development.—There are men of limited observation who are breaking into print with a warning against a possible overproduction of honey. Their arguments are very weak, and it is safe to say that the present output might be doubled two or three times over before there would be any danger of overproduction. As an example of the possibilities of market development, it is only necessary to point to the growth of the orange business during the past few years. Concerning the growth of that industry Mr. R. C. Gano, in the *American Bee Journal,* writes as follows:

Experience of Orange Growers

Back in 1895 the orange situation was much what the honey situation is to-day. Though at that time our national population was over 65,000,000, nearly two-thirds of what it is today, the California citrus growers found it difficult to sell at a fair profit an orange crop which was *one-ninth* the size of the crop they sell at a good profit to-day. These figures are absolutely authentic. The California citrus production in 1895 was less than 5000 carloads whereas the normal crop to-day is 45,000 carloads. The orange crop has increased 900 per cent., while the population has increased 50 per cent., and this indicates what is an actual fact, namely, that the people of the United States eat to-day seven or eight times as many oranges in a year as they did in 1895. What has changed their habits, in this regard? Nothing more nor less than advertising.

In 1895 they not only sold fewer oranges per capita, but they received a smaller profit per box.

In 1895 orange growers were every year afraid of over-production.

About that time the California Fruit Growers' Exchange was formed, because the growers realized that something would have to be done to develop a future for their business. To say that it began working miracles right from the start would hardly be an exaggeration. It studied the science of selling, and soon had the marketing end of the industry on a business basis. It began putting agents in the various market centres, and when a car-

load was ready for shipment it knew from its agents where to send it to get a good price. Fear of over-production soon became a thing of the past.

During the first five years of the Exchange's operation the citrus crop increased 255 per cent., from 1900 to 1905 it increased 71.7 per cent., from 1905 to 1910 it increased 10.9 per cent., and from 1910 to 1914 it increased 48.5 per cent. Two hundred million dollars is now invested in this industry in California.

The development of the markets can be expected to keep pace with the growth in production, at least until such a time as the amount of honey produced equals the output of many minor articles of food not in general demand. When we consider the enormous development of which the beekeeping industry is capable, there is certainly no need of being alarmed about over-doing it, while still much less than one per cent. of the available honey harvest is being gathered. To the author's way of thinking there is no better opportunity for the man of limited means in the whole agricultural field than is offered by beekeeping.

CHAPTER III

THE HONEY BEE FAMILY

With all the multitude of species of insects, man has been able to adapt very few to his own immediate needs. Hundreds of insects render an indirect service, such as the pollenation of blossoms, and a few have been used for food, as John ate locusts in the wilderness. Because of the social habit whereby thousands of bees live together in a single community and lay up a common store of honey, man has been able to provide them with a suitable home, in the hive, and so to manipulate the combs which they build as to greatly increase the amount of honey stored and to profit thereby. By the prevention of swarming at the time when the honey harvest is at its best, by reducing the number of non-producing drones which the colony is per-

mitted to raise and by improving the strain by selecting queens from the most vigorous stock, it is possible to secure several times the amount of surplus that could be taken from bees in the old-fashioned box hive or gum, managed on the let-alone plan.

Other insects, such as ants, termites, etc., have formed communitites and live from a common store. However, none of the others are of direct service to man as is the bee. For centuries their habits have been studied and much still remains to be learned concerning them.

The Bee Family.—The life of the hive centers in the queen, which is the mother of the colony and upon whose vigor the prosperity of the hive depends. Should she die, and the bees be unable to replace her, the colony would soon perish. While the workers are also females, the sexual organs are undeveloped and they could not supply the place of the queen mother. In queenless colonies laying workers often ap-

pear, but since they have never been mated, their offspring are all drones and the life of the community is not thereby prolonged. A prosperous hive contains many thousands of workers whose purpose in life is the gathering of the food supply, building of the combs, protection of the store, cleaning the hive and other labor necessary to the comfort of the inmates. The drones are males, but do not share in any productive work for the community. They are dependent upon their industrious sisters for their entire support and are tolerated, apparently, because of necessity for the perpetuation of the species. Late in fall when conditions no longer favor the gathering of honey, and when brood rearing has greatly diminished, or in seasons of scarcity, they are driven from the hive to perish.

In common with other insects, bees pass through four stages in completing their development. Strangely enough, different periods

of time are necessary for the growth of the different sexes and even of the queen and worker. First the eggs are laid by the queen mother, who lays hundreds and even thousands daily during the height of the season. Worker eggs are laid in the same kind of cells in which the honey is stored. Drone eggs are laid in similar cells somewhat larger in size, while eggs which are to produce queens are laid in specially built cells shaped like an inverted thimble and which have little depressions giving them something of the appearance of peanuts. At times only worker eggs will be laid for days at a time. When the colony gets very strong, and the hive is getting crowded, eggs will be laid in drone cells also, and queen cells may be built in preparation for swarming.

Three days are required for the eggs to hatch, all the eggs being alike in this respect. For the first three days all the larvæ are apparently treated alike, being fed on royal jelly,

a milky white substance furnished in abundance by the nurse bees. When the eggs hatch the little larvæ are very delicate, white in color, and show few external organs. By close examination the beekeeper can see them floating in the royal jelly so freely supplied. The queen larvæ are fed with this rich food throughout the entire larval period and complete the larval development in about a half day less time than is required for the workers. Any worker egg may be made to develop into a queen if the egg or newly hatched larva is transferred to a queen cell where it is fed on the richer food and has the larger cell in which to develop. Beekeepers take advantage of this fact to rear queens from good stock in large numbers. The worker and drone larvæ are only fed royal jelly during the first three days of their growth and then are weaned and fed on coarser food. Six days are required for the development of the worker larvæ and a few hours longer for

the drones. During the earlier stages of their development the little larvæ remain curled up in the bottoms of the cells, but when they complete their growth they stretch out lengthwise in the cells and spin very delicate cocoons and the cells are sealed over with wax.

The bee now enters upon the third stage of its life, that of the pupa. During this stage it takes no food and remains in absolute quiet. In something less than eight days the queens will complete the transformation, only sixteen days being required from the time the egg is laid until the mature queen is ready to leave her royal cell. The workers require twelve days for this stage and drones fifteen days. Twenty-one days is the time required for worker bees to develop from the egg and twenty-four days for the drone. It will be seen that it takes eight more days for the male bee to develop than for the perfect female, and three days more than for the worker or modified female.

The normal food of the bee is honey and pollen, both of which are gathered from flowers. Water is essential, especially during brood rearing and the bees seek it eagerly in early spring. In time of scarcity bees will take fruit juices or other sweets, but when there is plenty of nectar in the fields they pay little attention to anything else. At such times even honey may be exposed in the open air for days without attracting the bees.

NECTAR.—Since the bees are known to be very useful in distributing the pollen among the flowers it seems that nectar is secreted for the purpose of attracting the bees and other insects and thus insuring proper fertilization of the bloom. When first gathered by the bees it is very thin and watery, but a change of composition, called inversion, takes place in the honey sac of the bee, in which it is carried to the hive. After being placed in the cells it is evaporated and thickened and finally sealed. If

honey is taken from the hive too soon it is thin and will sour. The process of evaporation and thickening which takes place in the hive is called ripening. Usually honey that is well sealed is sufficiently well ripened for use, but honey from some flowers requires a good deal of time before it will reach the best condition.

Pollen, often called bee-bread, is used in large quantities as food for the young bees. A mixture of pollen and honey furnishes food for the worker larvæ after they are three days old.

Both queens and drones when in the hive are fed by the workers. Aside from pollen and nectar the bees also gather another substance, called propolis. This is used as a glue to close up the cracks on the approach of winter, to fasten down the cover, or other similar use. The beekeeper finds it difficult to remove the propolis from his hands after a few hours' work in the apiary on a warm day.

When the worker emerges from her cell she

does not go at once to the field, but remains within the hive for several days. At first she is as downy as a little chick and probably does nothing for a day or two. Soon, however, she begins her work as a nurse to the larvæ, which is probably her first duty. She shortly takes hold wherever a task needs attention, whether it be to feed the queen or drones, clean the hive, build combs, guard the entrance to the hive, or fanning to keep up a circulation of air, or any of the many duties necessary to care for such a large family.

After a few days the young workers will take short flights outside the hive, thus becoming familiar with surrounding conditions. At first they fly back and forth in front of the hive, never going more than a few feet from the entrance. With several hundred workers taking their first flights on a warm day, there is an appearance of great activity and the novice may be deceived into thinking that there is

much honey coming to the hive or that strange bees are robbing them. The distance of the flight is gradually lengthened until the worker becomes so familiar with the hive and its surroundings that it is no longer necessary for her to make note of her situation. She will then fly directly to the field and return to the exact place where the hive stood, even though it has been removed before she left. It thus becomes necessary to use great care in moving the hive to either make the distance so great that everything will be strange and the bees will make note of the change or else move it but a very short distance each day so that they will be able to find it after they return to the former position.

After the worker is two or three weeks old she will begin her trips to the field in search of honey or pollen and will continue the outside work as long as she lives.

In summer when the harvest is on, the

worker bee lives but a short time, probably not much more than six weeks. If the harvest is over before she emerges from her cell she may live for six months and help to begin the next season's garnering.

THE SWARM.—When the warm days come in spring the population of the hive will increase very rapidly. Apparently there is no settled rule that governs swarming. It is the natural method of increase, and as soon as a colony becomes strong, preparations for a division of the household may be made. In late May or early June, in a favorable season, the hive will be getting crowded. Thousands of workers will be gathering honey and caring for the multitudes of young bees that are daily hatching. By this time drones will be getting numerous and an examination may disclose from one to a dozen or more queen cells. The box hive beekeepers of our grandfathers' day would say that the bees will swarm, when they

begin to lay out in large clusters outside the hive. Practical beekeepers of the present day furnish the bees with sufficient room in which to work, and thus guard against such loafing. Under such conditions there was nothing for the bees to do but to swarm, since there was not room for them all in the hive, and, with honey abundant in the fields, the instinct to gather it was too strong to permit them to spend a summer in idleness.

When the beekeeper finds a number of queen cells in the hive at this season of the year he knows that the bees are preparing to swarm and makes plans accordingly. The bees will build queen cells also, when the queen is growing old and beginning to fail. This is done to insure a young queen to replace the feeble mother and is called "supercedure." When the old queen is replaced during the honey flow the bees are very likely to swarm anyway, even though there is an abundance of room in the hive.

The swarm may issue at any time after the queen cells are sealed, though it often delays until the young queens are ready to emerge. Everything will apparently be going on as usual, when, suddenly, the bees begin to pour out of the hive like mad. They fairly tumble over each other in their haste to reach the open air, where they begin circling about with a loud buzzing. The queen may be among the first to leave the hive or she may be near the last. While her going is necessary, and unless she does go the bees soon return to the hive, there is no more attention paid to her going, as far as can be seen, than to that of any other bee. After circling about for a short time the swarm usually clusters on a limb of a tree, or in some other convenient place. The place which proves most convenient for the bees is often most inconvenient for the beekeeper when there are large trees about.

The time was when there was a great beat-

ing of pans and other noise-making implements when the bees swarmed. The idea was that the noise would cause the bees to cluster. Beekeepers know now that ninety-nine times out of one hundred they will cluster anyway without so much fuss, and the hundredth time they will leave without ceremony in spite of the noise. Clustering is a normal part of the swarming and is as much to be expected as any other natural impulse.

It is an easy matter to hive the swarm by placing a hive in position and shaking the bees in front of it. They will usually go in without difficulty. If a small cluster remains on the outside, care should be used to see that the queen is not left behind, for otherwise the bees will not stay long inside the new home.

The first swarm to issue is called the prime swarm and there is no way to foretell its appearance without an examination of the interior of the hive. Since the colony is divided

for the purpose of founding a new establishment, the bees will fill their sacs with honey so that they are prepared to begin building combs at once. The swarm may remain clustered for several hours, or even for a day or two, in rare cases. The beekeeper should be prepared to hive his swarm at once to prevent them from absconding, or leaving for parts unknown. It is evident that scouts are out in search of a new home. It often happens that bees will be seen about a suitable opening for several days, when suddenly a swarm will appear and take possession. Where swarms remain clustered for long periods, it is apparent that the scouts have not yet found a suitable habitation.

The parent queen will leave the hive with the new swarm, which also attracts most of the field bees. The first queen to emerge from the cell after the swarm has left will usually seek for other queen cells and at once kill her rivals, unless she is prevented from doing so by the

bees. It often happens, however, that the bees have the swarming fever to such an extent that they are not satisfied with casting a prime swarm but will at once prepare for an after-swarm. In this case the queen is not permitted to injure the others still in the cells, but after a day or two a second swarm with this new queen will emerge. It often happens that several virgin queens will emerge and go with an after-swarm. Sometimes several after-swarms issue at brief intervals until the parent colony is reduced to a point where it is almost worthless.

Excessive swarming results disastrously to the dreams of a honey crop on the part of the beekeeper. Where natural swarming is permitted, steps should be taken to see that not more than one swarm is permitted to issue. The usual method is to place the new swarm on the old stand and to move the old hive some distance away. In this way the returning field

bees will go with the new swarm and the old stock will be so badly reduced that excess queen cells will be destroyed, and the bees will thereafter attend to business. It is well, also, to open the hive and remove all queen cells but one, or if a virgin queen has already issued and is present in the hive to remove all remaining queen cells.

THE MATING FLIGHT.—When the young queen has been out of her cell from four to eight days she takes her mating flight. In the meantime she takes short flights outside the hive, apparently for the purpose of marking the location. When time for mating arrives she circles high in the air, pursued by drones that chance to be flying near at hand. The mating always takes place in the air, the act being fatal to the drone. One mating is sufficient for life, under normal conditions, and the queen returns to the hive to remain until such time as she shall leave with a swarm. If perchance the queen

fails to become fertilized at the proper time, she disappears or becomes a drone layer. It has been proved beyond question that an unmated queen can produce male offspring. In fact, this is rather a common occurrence in the apiary. An unmated queen is worthless, however, since all her offspring will be drones, and unless she is replaced the colony will soon die. With a drone-laying queen, conditions in the hive are very similar to when there are fertile workers, as already mentioned. Since the drone is hatched from an unfertilized egg, he has no father. This is the case with several other insects, as is well known to naturalists.

Activities of the New Colony.—As soon as the swarm is settled in the new quarters the bees will form a compact cluster for the purpose of secreting wax and building combs. The wax scales are exuded from between the segments of the abdomen. A high temperature seems to be necessary to enable the bees to pro-

duce the wax and several pounds of honey are digested for each pound of wax secreted. Within a few hours the wax scales will be plentiful and the bees will begin building the new combs. Since the queen will need worker cells for immediate use the first cells built will be all of the worker size. If the queen is prolific the bees may build the hive nearly full of worker cells, but ordinarily it will not be long until the bees have more comb built than she can occupy, so the bees begin to build drone cells, which are larger and apparently easier to construct. It often happens that a new swarm which is allowed to build the combs without interference will construct from one fourth to three-fourths of the combs of drone cells. Too much drone comb insures that the following season large numbers of drones will be reared and that the colony can never be very profitable. The drones not only require more food, because of their larger size, but they add

nothing to the product of the hive and consume large quantities of stores after they have reached maturity. This condition is easily prevented by filling the frames with full sheets of foundation. Foundation is pure beeswax rolled very thin and impressed with the exact size and shape of worker combs. The bees are quick to avail themselves of this big start toward building their combs and a hive full of worker combs is the result.

If the swarm finds a home in a hollow tree or other natural cavity or is hived in a box, the combs will be curved and built in an irregular fashion, that facilitates the passing from one part of the brood nest to another. The operations of the beekeeper necessitate straight combs that can be examined without difficulty, so frames are placed in the hives and foundation placed in them as above mentioned, to insure straight and even combs, as well as cells of the desired size.

The combs serve the bees for several purposes. First the cells serve to provide snug receptacles for the young. They also serve as places to store the reserve food supply of honey and pollen and resting places for the bees.

The combs when first built are white, gradually growing darker with use until some old combs are almost black. However, there is a difference in color of the wax depending upon the source of the honey which the bees were gathering at the time. In some warm climates the wax is quite dark, and even in our northern states where white wax is the rule, some is yellow even at first.

CHAPTER IV

NECESSARY EQUIPMENT

THE equipment which the beginner should buy will depend upon the extent to which he wishes to engage in honey production, and whether he intends to produce comb or extracted honey. If the intention is to engage in beekeeping on a commercial scale as soon as possible, a very careful study of the local flora and of honey-producing systems should be made before starting, in order to avoid the purchase of a large amount of equipment which will later be discarded.

If the intention is to take up beekeeping merely as a diversion and only to keep a few colonies, extracted honey will probably be more satisfactory in nine cases in every ten. Equipment recommended in this chapter will be more especially for the novice who wishes to

keep but a few bees. The advice will be sound, however, for the man or woman who wishes to develop as rapidly as possible into a commercial business. "Productive Beekeeping," by the

FIG. 1.—A good smoker.

author of this book, is designed especially for commercial beekeepers, and considers many problems not possible in a book of this size.

IMPORTANCE OF A GOOD SMOKER.—The first implement that the novice should buy is a good smoker (Fig. 1). If he has black or mixed bees, it will be next to impossible to do

anything with them without the use of smoke. To appreciate the value of smoke in bee control it must be remembered that the beehive contains a highly organized community. While apparently there is no overlord who directs the work, each individual bee fills a place in performing the duties of the hive. As mentioned in the previous chapter, some are nurses, some are foragers, some are guards, etc. Probably every bee that lives out her normal life cycle performs all of these duties at some period of her existence. The only division of labor seems to be one of age. The young bees feed the young, secrete wax, etc., while the older ones go to the fields for nectar, pollen, etc. Aside from this general division of labor between young and older workers, the bees seem to take hold wherever inclination leads, or where the need is most pressing. Since the prime object of the labor of the community is the accumulation of a store of honey, guards

are very important to the safety of the hive. On the approach of strange bees or strange men, these guards are likely to use their stings vigorously to prevent the looting of their treasure.

By the use of smoke, the beekeeper can quickly disorganize the whole community and tear the hive to pieces without resistance. If the bees are blacks, much more smoke will be necessary than with gentle Italians or Caucasians. By placing the nozzle of the smoker against the front of the hive and blowing a few puffs of smoke into the entrance, and then removing the cover and blowing more over the tops of the frames, even cross bees are likely to be quickly quieted and to lose all thought of defence. Care should be used not to use any more smoke than is necessary, a very common fault with beginners. If the bees are gentle it will not be necessary to use smoke at the entrance, but only a little across the top of the

frames when the cover is removed. During the honey flow it is often possible to manipulate the hives of gentle strains without using any smoke.

When the smoke is blown into the hive the bees rush about confusedly for a moment, and then seek the open cells of honey. Their honey-sacs are filled as though they were about to swarm. When a worker bee is carrying a load of honey she seldom shows any desire to sting. This is why swarming bees are usually gentle. When the swarm is about to depart each bee will take a load, which will furnish a supply of available food for several days after the new home is reached.

Protection from Stings.—While experienced beekeepers often work among the bees without protection, especially during a honey flow, it is very unwise for the novice to do so. The experienced beekeeper is so familiar with the habits of the bees that he is not

likely to disturb them under conditions that will arouse serious resentment. On the other hand, the novice may be greatly surprised by a furore of excitement in the hive and numerous stings, even though he approaches the hive exactly as he may have done on other occasions without seeming to attract much notice from the bees. The inmates of the hive are very responsive to changes in weather or other conditions, and their temper varies accordingly. During a bright day when there is a good honey flow they may be very gentle, while on a chill or cloudy day when there is no honey coming from the fields, they may be very cross and easily aroused.

A veil that will prevent the bees from reaching the head is easily made at home, or one can be bought from any dealer in bee supplies. While mosquito bar sewed to the rim of a straw hat will serve the purpose, it obstructs the vision and is not nearly as good as one made of

wire screen, sewed to the rim of a felt hat. An apron sewed to the bottom with a draw string in it, prevents the bees from crawling under.

Some kind of gloves should also be worn to protect the hands. Any protection that will prevent the bees from reaching the exposed parts of the body, while permitting freedom of motion and unobstructed sight will answer the purpose very well.

FIG. 2.—The value of the hive tool is far above its cost.

THE VALUE OF A HIVE TOOL cannot be measured by its cost. While many persons get along with a small chisel or screw driver, the cost of a hive tool is so slight and it can be put to so many uses that one cannot afford to be without it, even though he has but two or three colonies of bees (Fig. 2). The hive tool is used to loosen the cover, pry up the frames, scrape off the burr combs and bits of wax and propolis

attached to unnecessary and inconvenient places, and for many similar purposes. If one has a small box or can in which to drop all stray bits of wax he will keep his frames in enough better condition to make his work much easier and pleasanter, while at the same time saving enough wax that would otherwise go to waste to pay for the tool many times over.

Bee-Escapes Should Also be Included in Even a Small Outfit.—It is so easy to remove surplus honey from the hive by the use of bee-escapes that they are a practical necessity. These are of different kinds, but the principle is the same. The bees are able to go down but cannot return. By placing a honey-board containing an escape under a super the bees are all down in the hive below within a few hours, and the super can be lifted off and the honey removed without any annoyance of fighting bees (Fig. 3). If the super is taken off without using an escape it will be full of bees

which must be driven out. This takes time, is unpleasant and also results in more or less damage to the honey, as the bees will gnaw the cappings when smoke is used to drive them out.

Escapes are inexpensive, and if one has but

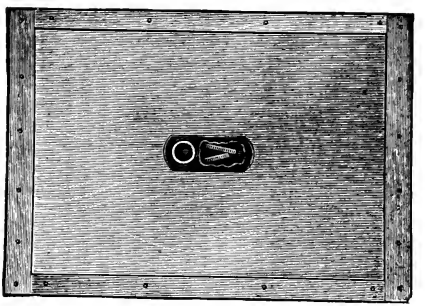

FIG. 3.—It is easy to remove honey from the hive by placing a bee-escape under the super.

a few colonies of bees, but one or two will be necessary as the honey can be removed from one hive at a time. They can be bought singly at about fifty cents each, board and all. In quantities they can be had for still less.

USELESS EQUIPMENT.—The author, in common with most other beekeepers, has invested

many dollars in equipment which is never used. While there are other articles which can be conveniently used, and which become necessary in handling a large number of hives, the above meagre list includes all the tools actually necessary to care for three or four hives of bees run for comb honey. Hives and hive parts will be considered in the next chapter, but even with hives, simplicity and economy work for efficiency in honey production.

Nearly every supply catalogue lists swarm catchers, and they are usually about the first thing purchased by the beginner, yet after visiting hundreds of apiaries the author cannot recall one where a swarm catcher such as is described in the supply catalogues is used for taking swarms.

Queen and drone traps are not useless, but they are of little value and are very seldom used by an efficient beekeeper. It is far easier and cheaper to prevent the raising of too many

drones in the first place, which is easily done by the use of full sheets of foundation in the brood-frames, as explained later on. Numerous articles of this kind appear from time to time only to be discarded and their manufacture discontinued for lack of demand. The tendency of the supply dealers of late is to eliminate useless equipment from their catalogues, so that the novice is not tempted by things of this kind as much as formerly.

IF A NUMBER OF COLONIES are kept, a section press for folding the sections and a foundation fastener will be necessary, as too much time will be required in preparing the comb honey supers without them. Since there are several different kinds described in every catalogue of supplies, most all of which are good, it is not necessary for the author to state his personal preference here. To do so might lead the reader to buy the special kind, when another might suit him better after giving both a trial.

Special Equipment for Extracted Honey.—For the production of extracted honey, an extractor, of course, is necessary. A small two-frame hand extractor will be sufficient for the small apiary. A commercial apiary will need at least a four-frame machine, and many of them use eight-frame or larger machines.

To extract the honey the beekeeper takes the frames of honey from the bees and carefully cuts the cappings from both sides of the comb with a warm knife. The frames are then placed in the baskets of the extractor and turned very rapidly (Fig. 4). The motion of the baskets whirling inside the big can throws the honey out of the combs and against the side of the can. It is then drawn off through a faucet in the bottom of the extractor. Extracted honey differs from strained honey in thus being thrown out by centrifugal force, instead of being strained through a cloth after

the combs have been broken up. When the honey is extracted the combs are returned, undamaged, to the bees to be filled again, while with strained honey the combs are destroyed,

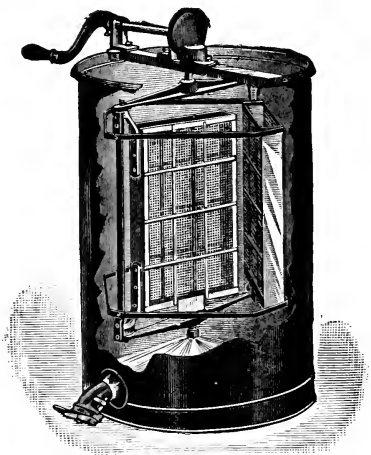

FIG. 4.—Honey is extracted by placing the combs in the baskets and revolving them rapidly.

and more or less foreign material is mixed with the honey.

COST OF STARTING.—The price of bees varies in different localities. In general it is safe to presume that a full colony of bees can

be bought for ten to fifteen dollars where there are any for sale. Often if one can find a bee-keeper who is offering bees for sale, he will ask not more than half that price, unless he has pure stock. Three hives are included, as but little more time will be necessary to care for three colonies than for less.

FOR COMB HONEY

Two pounds surplus foundation.
Four pounds medium brood foundation.
Three hives with one super each, nailed and painted.
Three extra supers complete.
Smoker.
Hive tool.
Veil.
Two honey boards with escapes.

FOR EXTRACTED HONEY

Three two-story hives.
Three extra supers, full depth.
Eleven and a half pounds medium brood foundation.
Smoker.
Hive tool.
Veil.
Extractor.
Uncapping knife.

If but one colony of bees is purchased the extra hives will probably be sufficient for the natural increase the first year at least.

The man who expects to go into honey production extensively must expect to invest about ten to twenty dollars per colony in hives, bees, equipment, etc. Thus five hundred colonies of bees will represent a working capital of five to ten thousand dollars. In addition to the hives and equipment necessary for a few colonies, the large producer will need honey houses, cellars or wintering cases, and a team or automobile for getting his product to market and going to and from his various apiaries.

CHAPTER V

HIVES AND HIVE PARTS

In their wild state bees lived in hollow trees or in cavities in the rocks. Instead of being straight, their combs were often built with a curve suited to the particular cavity in which they were built. Since the convenience of the bees in passing from one part of their hive to another was the only thing to be considered, the combs were built in a natural manner. When man first undertook to profit from the labor of the bees by supplying them with suitable shelter, he was content to furnish them with a hollow log, a straw skep, or a rude box and permit them to build their combs in their own way. Such honey as could be secured was taken from them by cutting out a part of the combs from the main cavity or by killing the bees and taking all their store. After a time

they were supplied with boxes with holes in the top and another box was set on top of the other. If the colony became strong and the lower box became crowded they would sometimes fill the upper one also, and that would then be removed with little injury to the bees, since they would usually have sufficient stores below to keep them through the winter.

It is easy to see that beekeeping could never develop into a profitable enterprise under such conditions. There are men still living who remember the time when it was thought that there was no better way in which to keep bees. When Langstroth invented the movable frame hive, it resulted in the revolution of honey production and the development of an industry, which while yet in its infancy, adds millions to the wealth of the commonwealth, and from which many people derive their livelihood.

Mr. Langstroth's invention provided a separate frame for each comb (Fig. 5) and led

the bees to build straight, instead of curved combs. This enables the beekeeper to reach any corner of the hive at any time desired and to remove combs which are full of honey and to replace them with empty ones, or if the col-

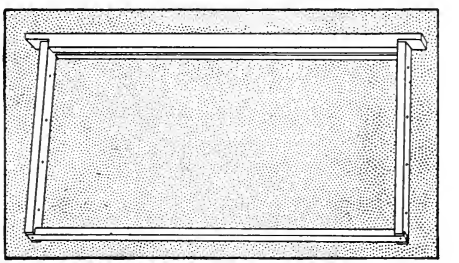

FIG. 5.—The Langstroth frame.

ony needs feed to give them full combs in place of the empty ones. Instead of a matter of guess it now becomes one of the most easily directed agricultural pursuits, for with a suitable season, the beekeeper can so manipulate his colonies as to obtain the maximum amount of honey. It is now possible to examine the brood nest at any time and ascertain whether or not

disease be present, whether the queen is prolific, or failing, or whether the bees are building queen cells in preparation for swarming.

KINDS OF HIVES.—There are still several kinds of hives in the market, although not nearly as many as there were a few years ago. The supply dealers are finding it greatly to their advantage to standardize their goods and are making a conscientious effort to offer their customers only such as will give satisfactory results. There are still a few small hives offered for comb honey which should not be manufactured, and which in the writer's opinion will not find a market much longer. In order to give the best results the brood chamber of any hive must be large enough to give a prolific queen plenty of room to lay, for it is only the strong colonies that pile up big crops of honey. Unless there is plenty of room for the queen to lay to the limit of her capacity, the colony can never store as much honey as it would under more favorable conditions.

The author always recommends the ten-frame Langstroth or dove-tailed hive for both comb and extracted honey. This hive is preferred for the reason that it is in more general use, and has found favor with more people than any other hive. If the beekeeper proposes to produce only extracted honey, the Dadant hive with its deeper frame has some advantages which it will pay to consider well before making a final decision. The beginner who expects to keep only a few colonies for pleasure will find the ten-frame dove-tailed hive best for his purpose, for surplus stock can be sold in these hives more readily, and the same hivebody can be adapted to the production of either comb or extracted honey by simply a change of supers.

Parts of Hives.—Whether one intends to produce comb or extracted honey the brood chamber of the hive will be the same, as will the top and bottom. The super, which is the store room for the surplus honey, is very different, however.

The empty hivebody is like a box with neither top nor bottom (Fig. 6). Inside this hivebody the frames hang. The bees build a comb in each frame. Fig. 5 shows the empty

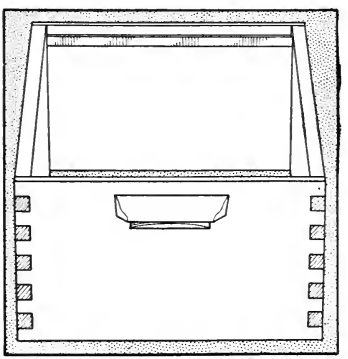

FIG. 6.—The hivebody is like an empty box.

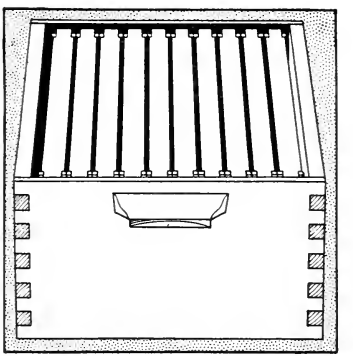

FIG. 7.—Hivebody with frames in place.

frame. The beginner is often confused by the different kinds of frames offered in the catalogue. Hoffman frames are the same size as the regular Langstroth frame, but they are so constructed that they are more nearly self-spacing. Fig. 7 shows a hivebody with frames in place. In late fall when no more honey will

come in, there is no need of supers, so with the addition of the top and bottom the hive will be complete as used at that season.

Comb-Honey Super.—Many beginners will prefer to produce comb honey, especially

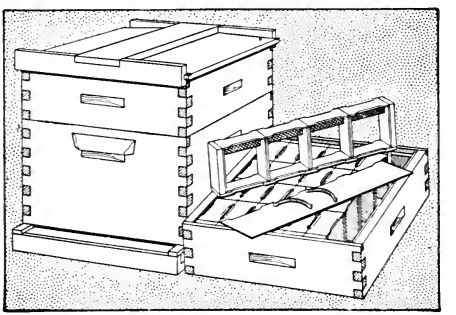

Fig. 8.—Hive for production of honey in sections, or comb honey.

if they have only a few bees. At Fig. 8 will be seen a hive with comb-honey super in place and a second super showing parts beside it. Comb honey is marketed in the small sections which are designed to hold one pound. When filled entirely and well finished they will weigh sixteen ounces, but the greater part of the sec-

tions marketed fall somewhat short of the full weight. A comb-honey super for a ten-frame hive holds twenty-eight of these one-pound sections. In the figure there is a section holder

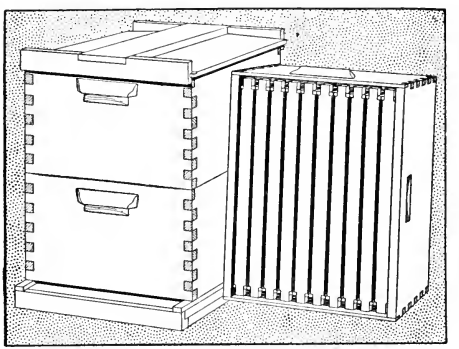

Fig. 9.—Hive for producing extracted honey.

with four sections laying across the top. There is also a separator lying beside it. The separator is a thin sheet of wood which is placed between the rows of sections to prevent the bees from building the combs too thick or uneven. By placing thin sheets of starter, or foundation in these sections as described elsewhere, the bees

are induced to build nice straight combs such as we see in the markets.

Extracted-Honey Super. — Extracted-honey supers are of two kinds, the deep and the shallow. The author prefers the deep super because it is the same size as the hivebody, and serves the same purpose in an emergency. If the hives and supers are of the same size, it saves much needless duplication which becomes necessary if different sizes are used. Fig. 9 shows an extracted honey hive together with empty super by its side. It is in fact a two-story hive.

The shallow super is very similar excepting that the frames are not so deep and the super correspondingly smaller.

CHAPTER VI

PASTURE FOR BEES

SOME OF THE PLANTS THAT MAKE THE BEST HONEY IN VARIOUS SECTIONS.—Since the invention of the movable-frame hive has made commercial honey production possible, it has been the dream of the beekeeping specialist to grow special honey-producing plants in sufficient quantity to insure a honey crop. At one time the Michigan Agricultural College sowed a field to Rocky Mountain bee plant to find out its value for the honey producer, but as yet no plant has been found that will produce nectar in sufficient quantity to justify its cultivation for honey alone.

There are, however, a number of forage plants that are valuable both as sources of nectar and for hay or pasture, and beekeepers have sometimes found it profitable to pay part of the

cost of seed sown by neighboring farmers in order that they might profit by the honey. Alsike and white or Dutch clover are especially valuable for this double purpose. When clover is grown for seed an arrangement satisfactory to both farmer and beekeeper may be made, as the presence of large numbers of bees greatly facilitates pollination of the blossoms, with the result that a larger crop of clover seed will be secured.

Sweet clover has long been a favorite with beekeepers, because of its abundant nectar secretion. For many years it was regarded as a weed, and its introduction was regarded with disfavor by farmers. In one locality of my acquaintance a beekeeping farmer so stirred his neighbors by sowing a small field of sweet clover that they sought to have him prosecuted for introducing noxious weeds. Sweet clover has now come into its own in that locality; many farmers are growing it, and the original

introducer has 170 acres of it on his 400-acre farm. He also has 300 colonies of bees, and more than a carload of the finest white honey is shipped from his apiary some seasons.

Since it is not profitable to grow crops especially for bee pasturage, the beekeeper must have land enough for a large acreage of some crop valuable for honey production and for forage for livestock, or he must select a location where suitable plants are grown. Unless he is surrounded with suitable flora he will find it difficult to grow a sufficient acreage of any plant to make his apiary profitable.

Bees fly over an area from one to three miles in every direction from the hive. It is evident that considerable territory is required to grow a sufficient amount of bee pasturage to support even a moderate-sized apiary. Five to ten acres of any special crop will help, of course, but no very appreciable increase of honey will be noticed from such a small area, except under unusual circumstances.

Pasturage Early in the Season Necessary.—No single crop will make a satisfactory dependence for the honey producer, although sweet clover will come as near doing it as anything. If the beekeeper wants to make honey production an exclusive business he should seek a location where there is a great variety of honey-producing plants through a long season. Some of the sources that produce the largest yields are uncertain, yielding profitably only once in two to five years. Such a source is basswood. When there is a large acreage of basswood forest within reach the beekeeper should get a splendid crop from it now and then. But if this is his main dependence profitable crops are likely to be several years apart.

Some plant that yields nectar and pollen early in the season, to stimulate brood rearing in advance of the main flow, is of great importance. For this purpose fruit bloom and dandelions are much sought for in the Northern

States. When nectar is coming to the hive the queen will be active and will lay large numbers of eggs. Young bees will shortly appear in large numbers, making strong colonies that are absolutely essential to storing profitable honey crops. After the long winters the colonies will be greatly reduced and some time will be required to enable them to reach normal strength.

When the main honey flow is from white clover, as in most of the Northern States, the beekeeper must lend every aid to get the bees ready for the harvest. Colonies that are weak at the beginning of harvest are seldom profitable, as the honey flow will be over before they are ready for storing in earnest. Big colonies, with the hives fairly running over with bees, are the ones that pile up honey.

To begin the season, as soon as frost is out of the ground and the days are warm enough for the bees to fly, the willows and maples furnish the first taste of nectar. The elms fur-

nish large quantities of pollen, which is an essential food for the young bees. Following these, the fruit trees bloom and then the dandelions. Thus there is no break. If nectar secretion is suddenly checked, the queen will stop laying until it begins again, unless the bees are fed to stimulate a light honey flow. Thus a locality that favors early brood rearing is one where the bees are ready for business when the flow from clover really begins. It often happens that the clover flow does not last more than two to four weeks. Strong colonies will store a surprising amount of honey in that short period, which in many localities is the only source of surplus.

Alfalfa is the principal source of nectar in many irrigated sections of the West. For some unaccountable reason it secretes little nectar in the humid regions east of the Missouri River, but many carloads of alfalfa honey reach the Eastern markets from Colorado, Idaho, Utah and other Western States.

A number of minor crops produce well in limited localities. Wild asters, of many species and of wide distribution, bloom late in the fall and often furnish a crop of honey in seasons when other sources have failed.

The partridge pea of the roadside is visited freely by the bees in the Northern States, but little is thought of it as a honey plant. In parts of Florida large crops are gathered from it. In some localities wild sunflowers are so abundant that the bees profit wonderfully, and a substantial addition is made to the beekeeper's output. Goldenrod is an uncertain yielder in late autumn. In some localities it is valued very highly, and is sufficiently abundant to produce a profitable quantity of nectar; in other sections the bees seldom visit it.

Heartsease or smartweed, also called lady's thumb, is an important source of honey in many places. In extremely wet years, when fields are too wet to plant to the usual crops or when

large areas are overflowed, this plant often comes up over large areas and yields heavily to the bees in mid-summer. Plants like catnip, which are not abundant, but yield large quantities of nectar, add to the sum total of the season's production.

Locality is the beekeeper's big problem. If the locality is poor little can be done to improve it unless some profitable nectar-yielding plant is generally introduced into the neighborhood. The commercial growing of cucumbers and cantaloupes furnishes splendid pasturage for the bees during the season of bloom. Buckwheat is one of the main sources of dependence in New York and other Eastern States, yet in Iowa it seldom amounts to much as a honey plant.

It often happens that a season is unfavorable in one place while a fair crop is gathered not more than ten to twenty miles distant, because of rains or some other local condition.

The wide-awake beekeeper often avoids failure by moving his bees to favorable pasturage.

The same general principles will apply to the Pacific Coast and the South, although the list of plants will be different. In mild climates where the bees can fly every week in the year, it is important to have as many plants that bloom during the season between honey flows as possible.

In cities and towns it is seldom advisable to keep a large number of colonies. Usually there is sufficient pasture from sweet clover and such weeds as motherwort along the canals and railroads, white clover on the lawns and such trees as basswood in the parks and along the residence streets to support the bees. The author often receives letters from city dwellers asking what crops they can plant in order to keep bees. There seems to be a common impression that it might be possible to grow enough of some nectar-producing plant in the

back yard to supply the needs of a colony or two of bees without difficulty. Such persons are always informed that there is nothing that they can plant in such limited space which will make any noticeable difference in the product of the hive.

Importance of Pollen.—An abundance of pollen for spring brood rearing is very important, and plants that produce pollen in quantity at this important season are second in value, only, to plants that yield a liberal surplus of honey. Without a plentiful supply of pollen, brood rearing will not progress in a satisfactory manner, as it is absolutely essential for larval food. In most localities there is seldom a scarcity of pollen during the height of the season, but in some places the bees do not find it plentiful at the time when they should be building up in preparation for the honey flow. Rye flour, meal or other substitutes which will supply the bees with protein are sometimes resorted

to in an emergency, but there is nothing equal to natural pollen for brood rearing. The successful beekeeper always studies the honey and pollen sources of his locality.

There are many plants that furnish both honey and pollen, while there are others that furnish only one. Many of the plants which furnish pollen in greatest abundance furnish no nectar at any time.

The corn plant furnishes pollen in great quantities, yet the blossoms do not secrete nectar. The bees are said at times to secure a sweet substance from the base of the leaves, and since aphids are sometimes found on the plant, honeydew, which is an insect excretion, may be gathered from this source. Ragweed, elm, etc., are also valuable sources of pollen.

Differences in Season.—There may be an abundance of blossoms of the best honey plants and yet, in some seasons, the bees will get but little honey. Just what conditions in-

fluence the flow of nectar are not fully understood. One plant will yield most freely under given conditions when another will not yield at all. Some plants yield best under warm and moist conditions, while others require hot and dry weather. For this reason plants that furnish honey in quantity in one locality, often fail entirely in another. Alfalfa is one of the best honey plants in the West, but of little value in the humid climate of the East. Buckwheat is a dependable source in New York, but seldom produces any surplus in Iowa.

All these things must be taken into account by the beginner who expects to realize a good return from his bees. He must learn the kind of blossoms on which to place the most dependence in his locality, and plan his operations so as to have his bees in the best possible condition at the time of the bloom of these plants. In Iowa it is of little importance to have colonies strong after the close of the white clover

flow, except in a few limited spots. In some eastern localities it is not important that the colonies reach their maximum strength so early since there will be little for them to gather until after midsummer.

In almost any locality there will be an occasional season when the honey crop will be a failure. There will also be several years when poor or moderate crops are gathered and an occasional year when a bountiful harvest will be brought in by every colony of reasonable strength. It should always be borne in mind that it is only the strong colonies that gather the profitable crops.

THE PRINCIPAL HONEY PLANTS

Northeastern States:

Basswood, or Linden.
Buckwheat.
Clover, alsike, white, sweet, etc. All the clovers yield nectar, but some have corollas so deep that the bees are unable to reach it.
Willows.
Maples.
Milkweed.
Spanish needles.
Indian currant, or coral berry.
Heartsease, or smartweeds.

Fruit blossoms. Apples, pears, peaches, strawberries, raspberries and other fruits are valuable honey plants.
Dandelions furnish both nectar and pollen in abundance.
Vervain, or verbena.
Wild sunflowers.
Sumac.
Asters.
Golden rod.

California:

Yucca.
Willows.
Mustard.
Rocky Mountain bee plant.
Fruit, including orange, apple, pear, etc.
Clover, including sweet clover.
Alfalfa.
Lima bean.
Alfilerilla and filaree.
Prickly pear.
Gum, or eucalyptus, of which there are several species.
Blue thistle.
Manzanita.
Carpet grass.
Sage, of several kinds.
Blue curls.
Tarweed.
Goldenrod.

Texas:

Horsemint.
Alfalfa.
Basswood.
Cactus or prickly pear.
Catsclaw and huajilla, species of acacia.
Wild sunflowers.
Mezquit, or screw bean.
Cotton.
Sumac.
White and sweet clover.
Fruit, including apples, pears, etc., and such wild fruits as hawthorne.
Melons and cucumbers.
Hoarhound.

Florida and Southeastern States:

Gallberry.
Tupelo.
Cow pea.
Hop tree.
Holly.
Logwood.
Manchineel.
Fruit, including orange, which yields well in Florida.
Palmetto.
Partridge pea.
Pepper bush.
Pepper tree.
Pennyroyal.
Rhododendron.
Sourwood.
Snowvine.
Titi, both white and black.
Tulip tree.

CHAPTER VII

SUGGESTIONS FOR GETTING STARTED WITH BEES

It is usually best to seek out some beekeeper as near home as possible, and buy two or three colonies to be moved to the new location. If the bees are not in such hives as the buyer wishes to use they must be transferred with the attendant discomfort and danger of loss of brood and queen, as well as the severe setback given the colony in the operation.

The up-to-date beekeeper who cannot get what he wants near home buys bees in packages, queens included, and places them on full sheets of foundation in new hives. There is a minimum of trouble and bother, while the bees act much like a newly hived swarm and proceed to comb building at once. By this method it will be necessary to wait until there is honey to be had in the fields, so that the bees

can build their combs under favorable conditions. Since there are now numerous breeders who specialize in bees in combless packages it is an easy matter to buy whatever number are wanted and to get them at about the time desired. Correspondence with the breeder some time in advance will insure delivery at the proper time. Some care should be used to insure dealing with a reliable person. Since the bee journals go to a good deal of trouble to investigate the standing of their advertisers, it is easily possible to protect one's self in advance by writing to the editor of one of the journals and making enquiry about the standing of the particular breeder with which one contemplates placing the order.

If it seems desirable to purchase bees already on combs, the novice should always have some experienced beekeeper examine them for him if possible, to insure that the bees are not queenless, or that there is not too much drone

comb in the hive. It often happens that the person wishing to buy bees will find it necessary to take about what is offered. If bees in poor condition are purchased, the buyer should pay accordingly and know what is necessary to put them in proper condition to harvest a profitable crop. Personally the author would prefer to pay a liberal price for Italian bees, on straight combs, in good hives, than to buy black or hybrid bees in undesirable hives at any price. The bother of transferring, the cost of new hives and queens and the time lost will amount to considerable, to say nothing of the irritation caused by such a disagreeable task.

TRANSFERRING.—When the bees are purchased in such hives, it is usually the best plan to leave them in the old hive until they swarm. The new swarm should be hived in a new ten-frame hive and set where the old one stood. The old hive should be set close to one side of the new swarm, on the old stand. After about

a week set the old hive on the other side of the new one. The object of this is to get all the young bees as fast as they emerge to go into the new hive with the swarm. After three weeks from the time that the swarm issued all young bees will have emerged and they can then be shaken in front of the new hive with the swarm and the old hive broken up. The old combs can be melted into wax.

Another way is to set the new hive on top of the old hive at once and not wait for the bees to swarm. The top of the old hive and bottom of the new one should, of course, be removed so that the new hive will serve as a super. Usually the queen will soon go above and begin to lay so that the old hive can be removed from underneath as soon as all the brood has emerged. Sufficient super room should be placed above the new hive to permit the bees to continue to work without crowding the new hive, or they may be slow to begin

housekeeping above and simply use the new hive to store their honey.

Formerly it was a common practice to transfer bees by cutting out the combs from the old hive and tying them into the frames. The bees would fasten the combs to the frames and remove the strings. Such combs, however, are never very satisfactory and the plan is not to be recommended generally. There are times when bees are to be removed from the side of a building or hollow tree or other position where they are not readily accessible, when this method is necessary. In most cases it will be advisable to substitute new combs or full sheets of foundation, and to melt up the transferred combs after the bees are established in the new hive.

Time to Start.—In the Northern States the best time to begin beekeeping is in spring. When fruit trees are blooming is a good time. The bees can then find plenty of stores from

the beginning, and if the season be favorable they should store a crop of honey for their owner the first summer.

The fruit trees bloom several weeks before the main honey flow, so that there is time for a small colony to build up and become populous before the blooming of the white clover, which is the main source of nectar east of the Missouri River.

Moving Bees.—If bees are bought which are already on combs there are several things to be considered. If they are moved but a short distance, many of the bees will go back to the old location. If the distance is two or three miles or more there will be little to fear on that score. For shorter distances some means must be taken to insure that they will make note of their new location before going to the fields. It is a common practice to put the colony in a dark cellar for a few days before setting them on their new stand, and then to jar the hive

somewhat when releasing them or take some other means of causing them to notice their new location.

If they are to be moved but a few rods or across a small lot, the best way is to move them two or three feet each day. Even this short distance will cause them great confusion at first, although they will quickly adjust themselves to it.

If there be brood and honey in the hive and the weather be hot, there is great danger of melting the combs and smothering the bees when confined. Even if the hives are to be hauled but a few miles and be on the way only an hour or two plenty of ventilation should be given. It is very difficult to move bees heavy with brood and honey in hot weather, for the amount of heat generated is surprising. An empty super on top of the hive to give the bees a place to cluster, and this covered with screen to provide ventilation is as little as can be done

with safety. In addition, the entrance should be closed, and if the hive can be raised a few inches off the bottom to leave a space under the frames it is very desirable. Nearly every beekeeper of experience can point to some disastrous result of moving bees without sufficient ventilation. In cold weather or when there is little brood in the hive, the difficulties are much less.

STARTING BEEKEEPING COMMERCIALLY.—To the man who expects to make beekeeping a business some of the advice above given will hardly apply. He will wish to start on a larger scale and increase as rapidly as is consistent with safety in order to get returns as soon as possible. While many men have taken up beekeeping without previous training and have succeeded, it is a better plan to spend a season in the employ of a successful apiarist and to become familiar with the general practice of beekeeping. He can then buy a reasonable

number of colonies and undertake their care with little risk. While the author is personally acquainted with one man who began by buying eight hundred colonies, even though he knew almost nothing about bees, and has been successful, there is a great deal of risk in such a venture. An epidemic of disease, a poor season when robbing was bad or any one of several adverse conditions would result very disastrously. While the general advice to begin with not more than two or three colonies may not always apply, it is much safer to begin with such a number as one can lose without seriously crippling one's resources. An apiary of fifty colonies properly handled can be increased to three or four times that number in a season, and give the owner some valuable experience. The person who has not had some previous experience may very well be cautioned against plunging too heavily on the start. Even though there were no other danger, one who has no

particular system in mind would easily be led into buying a lot of equipment which will be unsuited to the location in which he lives, or the system of honey production which he may later decide to follow.

Choosing a Location.—To the man who expects to make honey production a business the choice of a location is a most important matter. The honey plants within reach and the markets available for his crop are both prime essentials for success. If the locality is already well stocked with bees he cannot hope for a profitable venture unless he buy out some man already on the ground, and thus take over the bees that are already located.

If there are long periods of time when no honey is gathered, it will draw too heavily on the stores to make a profitable season probable. A desirable location is one where there is something from which the bees can at least get a living during most of the growing season, so

that the honey stored during the main honey flow will be mostly surplus. If there are two good honey flows so much the better. There are many localities where the bees get sufficient stores for early brood rearing from fruit bloom and dandelion blossoms, followed by a good flow from white and sweet clover and also another later flow from heartsease, Spanish needle or some other plant.

An abundance of pollen early in spring is an important consideration, for without it the bees are slow in breeding up populous colonies, such as are essential for storing big crops (see Chapter VI).

In some favorable markets honey brings twice the price that it does in others. If one is so situated that he can build up a profitable retail trade and thus realize the maximum price for his product, it will add materially to his income.

In general it will not pay a man to leave

his home community and move to a distant state to engage in beekeeping, unless there is some reason for going other than to find bee pasturage, for there are few bonanza bee locations. However, it often happens that a distance of but a few miles in one's own county will make a great difference in the possible honey production. The character of the crops grown, nearness to streams and similar things make more difference than long distances in miles. A neighborhood where alsike clover is grown for seed, or where there are large areas of white clover pasture, should be much better than neighborhoods where most of the land is cultivated in such crops as corn and wheat. The vicinity of fruit growers, or truck gardeners should be desired, other things being equal.

PLACING THE APIARY.—An apiary should never be placed in an exposed position if it can be avoided. A sheltered position is very desirable, especially during the cold spring

months. A natural windbreak is much more serviceable in breaking the winds than a tight board fence or a building.

Partial shade is to be preferred to open sunshine, at least for the comfort of the bee-keeper. While many apiaries placed in the blazing sun seem to give as good results as those in shade, the shaded situation, if not too dense, is to be preferred. Bees will not do as well in a situation where there is too much shade. Hives left in the open sun should be shaded with boards.

KEEPING DOWN WEEDS AND GRASS.—Some provision should be made for keeping the entrance of the hive free from grass and weeds. One often sees the hives surrounded with such a dense growth that the bees coming in with their loads can reach the hive with difficulty. Many heavily laden bees will be lost under such circumstances. Hives should be so placed that when a bee drops to the ground in front she can

crawl in without having to take wing again. A half hour's watch beside the hive during the height of the honey flow will soon demonstrate the importance of easy access to the hive for the home-coming workers. Hives set up on stakes or blocks are very difficult of access to bees that fall to the ground before reaching the alighting board. In most well-regulated apiaries the hives are placed on cement hive stands, or on boards so that the bees can walk right into the hive from the ground in front. If they are two or three inches higher than the ground around, a board is leaned against the front of the alighting board to bridge the gap.

Providing Water.—It is important that water be easy of access, as the bees use large quantities of it, especially in spring when brood rearing is at its height. A tub or half barrel of water, covered with chipped cork or shavings which will enable the bees to reach the water without drowning will serve the purpose very

well. Such a watering place should be placed early in spring before the bees form the habit of visiting water troughs or pumps, and thus annoying the neighbors. It is a simple matter to provide water in some open dish with suitable provision to save the bees from drowning, but it is important, unless there be a pond or stream within easy reach of the apiary.

CHAPTER VIII

WHEN BEES MUST BE FED

ALTHOUGH under normal conditions bees not only gather their own food, but store a surplus for their owner, there are times when it becomes necessary to supply them with food. Every year hundreds of colonies die for lack of sufficient stores because their owner is careless or ignorant of their needs. It is very poor policy to permit the bees to starve, and it is easy to supply their needs in this direction.

SWARMS WHICH ISSUE LATE will often be unable to gather sufficient honey to carry them through the winter. They can either be fed or united with stronger swarms which have a plentiful supply, as seems best. A large swarm will winter on less honey than a small one, and be worth much more in spring. The reason of this is very apparent. The source of the heat of the

colony is the honey consumed and it will require a larger consumption of food to maintain the temperature of a small cluster than a large one, just as less fuel is required to warm a room full of people, than one in which there are only two or three persons.

If the colony be a large one, it will pay to feed them a considerable amount of stores in order to get them through the winter, but a weak colony is usually worth more to strengthen medium or stronger ones than alone.

In removing the honey it often happens that an insufficient quantity is left for the bees. Before the bees are put away for winter, they should be carefully examined to make sure that a plentiful supply of stores is still in the hive. An equivalent of five or six full combs will usually be needed, and sometimes more. It is much safer to leave more than they will need than to take chances on an insufficient supply.

The author usually plans to leave at least forty pounds of honey for wintering. If the following spring is mild and favorable, it will not all be used, but if the weather in March and April is cold and backward they will often need to be given an additional supply to keep up brood rearing until the honey flow begins (see Winter Preparation).

The usual advice to allow twenty-five pounds does not make a sufficient allowance for an unfavorable spring following the winter, and it is easier and safer to give a plentiful supply in the fall to insure safety until after fruit bloom.

In seasons of scarcity the beekeeper should always examine his colonies to make sure that they have sufficient stores. If the weather is cold and wet in early spring so that the bees have little opportunity to fly, there is danger that all stores will be consumed in brood rearing and the colony will perish, as already

stated. This is a common occurrence among bees whose owners give them little attention.

Almost every season there will be times during the summer when no honey is coming to the hives, and if this condition prevails for any length of time the owner should guard against starvation. The author has known of many colonies starving in June, just at what should have been the time of a good honey flow. A long continued spell of rainy weather during which the bees could not fly was the cause. If such weather follows the time when the honey is taken from the hives at any time, some attention is necessary to guard against disaster from lack of food.

Occasionally there will be a year when little honey is stored all season through. At such times there is great loss, for too many bee-keepers depend upon the bees looking out for themselves, and never make any provision for feeding them. It would be no more foolish to

permit cattle or hogs to die of starvation because the forage crops are not sufficient, than to allow the bees to do so. They will harvest enough honey in a few weeks of good honey flow to tide them over a very long period of adverse condition.

For Queen Rearing and Building up Nuclei.—At any time during the summer when the honey flow stops and the bees stop bringing honey to the hive, the queen will check her egg laying. The queen breeder who wishes to raise queens at such seasons, or the beekeeper who has a lot of nuclei (small colonies made by division), will often find it necessary to feed the bees, even though there is plenty of honey in the hive. Brood-rearing must continue in these small colonies if they are to become sufficiently populous to winter as strong colonies. A little sugar syrup every day, in imitation of the natural amount of honey coming to the hive, will greatly assist in keeping the queen at her regular duties.

How to Feed.—The best possible feed for bees is the natural food, which is honey. The beekeeper will do well to reserve one full comb for every colony of bees that he has for feeding in case of emergency. This does not include the feed to be given at the close of the honey flow for the purpose of wintering, but there should be a liberal reserve after the bees are ready for winter, to insure an abundance of honey for spring brood-rearing. Some seasons it will not be needed, but it is very convenient to have at such times as feeding is necessary.

One great advantage in using natural stores is the ease with which it can be given. When a colony is found that needs stores, all that is necessary is to remove an empty comb and give a filled one in its place.

Feeding Sugar Syrup.—If sealed honey is not available, sugar syrup is the next best thing. The author would never advise feeding extracted honey, since it is more convenient to feed sugar.

The novice will very often feed his bees with corn syrup, molasses, or other sweet, with the mistaken idea that the bees can make use of any sweet substance. Such experiments often result in the death of the bees. If honey is not at hand, granulated sugar is the only thing that should be used. It is not safe to buy honey for feeding, because of the danger of getting honey from diseased colonies and thus bringing disease into the apiary.

A thick syrup should always be used for winter feed. Usually two parts sugar to one of water are used. By dissolving the sugar in boiling water and stirring freely the sugar will dissolve fully. Many use equal parts of sugar and water because it is easier to prepare the syrup than when a thicker one is made. When feeding for winter, it is well to save the bees as much as possible, especially if it be late in the season. In spring when feeding for brood-rearing or to carry the bees over a temporary

shortage of nectar, a thinner syrup will do.

FEEDERS.—The purchase of unnecessary equipment should always be discouraged. While at times a lot of feeders are convenient, the careful beekeeper will be able to plan his operations in such a manner as seldom to find use for them. As convenient a way of feeding as the writer has ever seen is that practiced by D. E. Lhommedieu, a well-known Iowa beekeeper. He makes his syrup in a wash-boiler and when ready for use takes empty combs and holding them at an angle of about forty-five degrees, pours the warm syrup into them with an ordinary dipper. The syrup must not be hot for wax melts at a low temperature and if too hot it would injure the combs. By turning the comb first on one side and then over and filling both sides, it will hold enough syrup to make a very good supply for temporary purposes, such as spring stimulative feeding. If there be a long-continued dearth, several such

combs will be needed. These filled combs of syrup are placed in the hive in the same way that combs of honey or empty combs are given.

Another method which utilizes equipment that every beekeeper has at hand, is to take an empty super and place on top of the hive. In this empty super is placed a tin pan of syrup and over the syrup a thin cotton cloth is spread. The bees can walk over the cloth and suck the liquid through it with little danger of drowning. The super is placed on the hive in the same manner as supers are for the storing of honey and the cover placed over all. Being directly over the cluster there is a minimum danger of starting robbing, as often happens when feed is placed near the entrance.

There are numerous different kinds of feeders on the market and the reader who wishes something different can find them listed in the catalogue of any dealer in supplies.

CHAPTER IX

USE OF FOUNDATION

One thing which has been impressed upon the writer by his work as a bee inspector, is the enormous losses among beekeepers generally from rearing useless drones. It is not uncommon in neglected apiaries to find hives with one-third to more than one-half drone comb. In some apiaries where good equipment is used and fairly good practice followed otherwise, this fault is apparent. It is very evident that the owners of such outfits cannot realize the great cost of rearing such large numbers of loafers instead of producing a profitable working force. If they did, such conditions would not be tolerated.

It requires as much food and attention from the nurse bees to rear drones as workers, and the drones will continue to be a tax on the col-

ony after they reach maturity, since they are consumers and not producers. It will be readily seen that a colony which is producing twenty per cent. or more of drones will seldom yield a satisfactory profit to the owner. At the Iowa Beekeepers' Convention, C. E. Dustman had an interesting paper on drones. He estimated that a square foot of drone comb in the hive would produce more than two thousand drones, while the same space and food might have been made to produce more than three thousand workers to add to the hive's productive force.

The writer has often found it hard to convince the novice of the value of full sheets of foundation. The first cost looks large and too often the bees are permitted to build their own combs with but a narrow strip of starter to prevent building crosswise. The two illustrations (Figs. 10 and 11) which we show in this connection tell more than pages of description. The impressions on the foundation being the

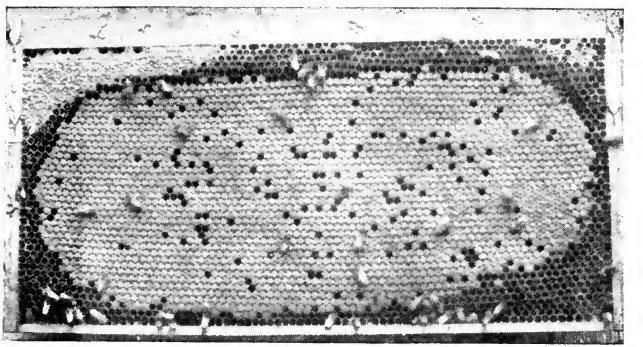

FIG. 10.—A good brood comb as a result of a full sheet of foundation.

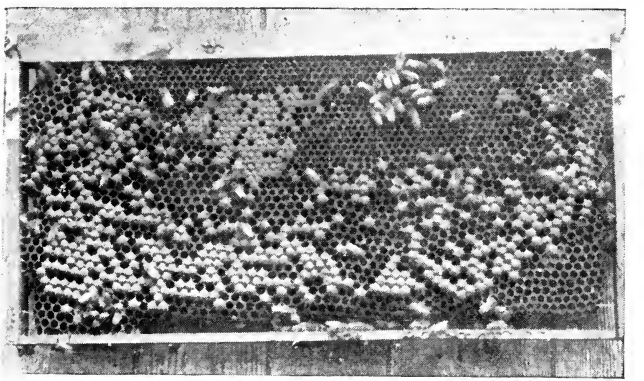

FIG. 11.—A comb composed largely of drone cells as a result of a narrow starter.

exact size and shape of the bases of worker cells, the bees will build mostly worker cells where foundation is used. Drone cells being larger require less wax in their construction and less labor as well. This being the case wherever worker cells are not needed for immediate use to meet the needs of the queen, drone cells will be built, for they serve equally as well for storing honey. Fig. 10 shows an ideal comb, attached on all four sides to the frame and composed entirely of worker cells most of which contain sealed brood. Fig. 11 shows a comb which is composed mostly of drone cells as a result of using a narrow starter instead of a full sheet of foundation. The high arched cappings show that many of these cells contain sealed drone brood. The cost in honey to rear a single brood of drones in such a comb would pay for a full sheet of foundation. This comb can be used as an extracting comb, but is a nuisance, since if it chances to get into the

brood nest the queen will make use of it to rear a brood of drones. Usually it will pay better to melt up such a comb at once and replace it with a full sheet (Fig. 12) rather than risk getting it used in this manner.

IRREGULAR COMBS, also, are often built

FIG. 12.—Full sheet of foundation in wired frame, ready for the bees.

where narrow strips are used. Not only are the combs likely to be composed mostly of drone cells, but they are likely to be uneven, which makes them undesirable. Uneven combs cannot readily be exchanged, and much time is also lost in uncapping or manipulating them.

The bees will always build some drone cells

in the best regulated hives, and a small number are not objectionable. The presence of some drones is necessary to insure the mating of young queens, but there is little danger that there will be a shortage for this purpose under normal conditions. Where full sheets of foundation are used, small clusters of drone cells are often built in the corners or at the ends.

If combs are damaged in any way, the tendency is always to repair them with cells of the larger size. Mice are fond of gnawing the combs and where the hive entrances are left wide open in winter, they are likely to enter and cause much damage. If the mice do not disturb the bees to the point where the colony will perish before spring, there will still be much damage to the combs. The portions that are rebuilt the following season will usually be composed of drone cells.

The writer is not only convinced that it pays to use full sheets of foundation in the brood

chamber, but fully believes that without them honey production is seldom profitable. That he practices what he preaches is evidenced by the fact that as this is written he is just finishing the preparation of more than twelve hundred frames of full sheets for use in one small apiary to replace discarded combs, and to provide reserve extracting combs. Without a large working force, big crops can never be harvested. The rearing of several thousand worthless drones to consume the honey, take the attention of the workers and get in the way generally, does not tend in this direction.

Foundation in Sections.—Some kind of starter is absolutely essential to getting the bees started to work in the comb-honey supers. It is very common practice to use a three-cornered piece of thin foundation no more than two inches across and sometimes much smaller. It is difficult for the bees to work to advantage on such small starters. Full sheets which lack

not more than a quarter of an inch of reaching the bottom or sides are much more economical, for they furnish the bees with a sufficient

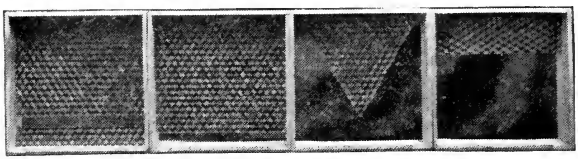

FIG. 13.—Different methods of using foundation in sections. The section at the left with full sheet and bottom starter is the best method.

amount of wax to start working nicely and room enough to permit a nice little cluster to

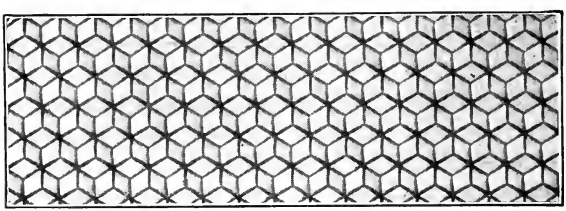

FIG. 14.—The thin sheets of wax are impressed with the cell bases of proper size to induce the bees to build worker combs.

work at one time. Thin or extra thin foundation should always be used in the sections. It costs more per pound, but is so much lighter

that a pound will go much further, and it is much better adapted to this purpose than the heavier foundation used in the brood frames. Not only do the bees occupy the sections more readily where full sheets are used, but they build more even combs and store more honey as a result (Fig. 13).

Economizing in the use of foundation is much like saving seed when one is planting a crop. While it costs more to use full sheets to begin with, so much more honey will be stored as a result that the increased cost is a profitable investment. Fig. 14 shows how the thin sheets of wax are impressed with the cell base which induces the bees to build worker combs.

CHAPTER X

BREEDING BETTER BEES

Good stock is as important to the beekeeper as to the stockman. It is, however, a much simpler matter to improve the strain of bees in an apiary than to make a similar change in a herd of cattle or even a flock of chickens. The life of the honeybee is short and the placing of a pure queen at the head of the colony will have the effect of replacing the whole working force of a hive with pure stock within a few weeks, or months, at most. If the colony is requeened in spring or summer the former stock will be replaced in a very short time. If the change is made in late autumn many of the late maturing bees from the former queen will remain in the hive until the following spring. During the honey flow the bees work at a furious pace and the whole colony is in a fever of excitement. As

a result the individual soon wears her life away in adding to the store of the community.

THE QUEEN IS PRODUCTIVE.—Since all the eggs from which this large working force is produced are laid by one queen, she must be enormously productive. All the beekeeper's plans are laid with the end in view of bringing each colony to the beginning of the honey harvest with the greatest possible number of bees in the hive. One extra strong colony will store more honey during a heavy flow than two or three medium colonies, and often more than a dozen weak ones. It is estimated that queens in populous colonies lay from two to three thousand or more eggs daily during the height of the season. In spite of this large production the colony often does not apparently increase in strength after the honey flow is really on, so rapidly do the workers wear themselves out in the harvest field.

It is then of the utmost importance for the

beekeeper to breed from the most prolific queens. While this is of first importance, since it largely determines the size of the crop, there are other important characteristics which must not be overlooked.

Desirable Traits.—No matter how good a record a colony may have for production, if the bees are cross and drive everybody out of the yard, the queen will not do to use as a breeder. Next to production, gentleness is the most desirable trait. If it were not for the fear of stings the number of beekeepers would be multiplied many fold. There are strains of bees which are very gentle under favorable conditions, and can often be handled safely without protection. Not long since the writer visited queen-breeding apiaries which are among the largest in the world. The proprietor stated that he never uses a queen as a breeder when the colony cannot be handled safely without smoke. Beekeepers generally

use smoke to control the bees. While under general apiary conditions it is seldom desirable to undertake operations without a lighted smoker at hand, there are often individual colonies which will not resent the manipulation of the frames even though no smoke is used. The selections of the queens at the head of such colonies for use as breeders, generation after generation, will hasten the time when stings will seldom interfere with the work of the beekeeper.

Following production and gentleness the non-swarming tendency is greatly to be desired. While there is much difference in the strains in this respect, it is to a much greater extent under the control of the beekeeper than the other factors named. If the bees swarm and the working force is divided at the beginning of the harvest, the crop is likely to be reduced as a result, unless the flow lasts for a long period. In most localities where honey production is

followed extensively the honey flows are rapid and of short duration. It is of great importance under such conditions to keep the colony together until the harvest is gathered. Hence the non-swarming tendency is desirable.

THE MALE PARENTAGE.—One serious drawback in queen breeding is the difficulty of controlling the male parentage. The queen mates on the wing and often meets a drone from a distant colony which may be of another race or inferior stock. The man who cannot send his queens to some isolated position where there are no other bees within four or five miles can do little to overcome this condition, other than to raise such large numbers of drones from his desirable colonies that the chances of meeting undesirable males is very greatly reduced.

Another difficulty lies in the fact that the quality of the male offspring is determined rather by the mating of the mother of the

queen than by her own. If it so happens that a queen has no opportunity to mate, she may still lay large numbers of eggs which will hatch, but they will all produce drones. If her mother was purely mated her offspring will be pure, but if her mother was mismated, her drones will be impure, regardless of the fact of whether she is purely mated herself or whether she be mated at all. It thus sometimes happens that a mismated queen whose mother was purely mated will produce drones which are pure, and her female offspring influenced by her own impure mating will all be crosses. It should be mentioned in passing that one mating is sufficient for life and a mismated queen is unable to produce pure offspring from later pure matings.

THE PRACTICAL RESULT.—While the above conditions add greatly to the perplexities of the queen breeder who would breed scientifically, they offer decided advantages to the

beekeeper who wishes to improve his stock in the quickest time and with least expense. By buying a purely mated queen and breeding from her he can soon change the conditions in his apiary even though his young queens meet impure drones. If he has, say, one hundred colonies of bees and will rear one hundred queens from the purely mated mother and requeen all his colonies his yard will soon be full of pure drones. At the same time the workers will all be crosses since the young queens have had no opportunity to meet pure drones on their mating flights. If the yard is requeened early in spring a second lot of queens can be reared in late summer from the same purely mated mother. By this time most of the original drones will have disappeared and the apiary will be abundantly supplied with pure males. The second lot of queens will meet pure drones and they can be used to replace the mismated stock already present. In this simple

manner the entire apiary of one hundred colonies can be changed from undesirable impure stock to pure stock of selected strain in one or, at most, two seasons and with little expense aside from the labor of the beekeeper.

The beekeper can readily secure good stock at from one dollar to two dollars each for queens and selected queens at a somewhat higher figure.

Methods of Rearing Queens.—The methods used for rearing queens will depend upon the number needed and the conditions under which the beekeeper is working. If only a few are wanted it is an easy matter to remove the queen from the colony from whose offspring it is desired to produce them. In a normal colony as soon as the queen is removed the bees will proceed to build cells to rear queens to make sure of replacing the mother of the colony. As soon as the queen cells are sealed they can be removed very carefully and one

placed in each of the hives which are to be requeened. The queen to be replaced must be removed about twelve hours before the cell is given, or it may not be accepted. The cell should be fastened carefully in the center of the brood nest to insure that it will not be chilled. One cell must be left in the parent colony to replace the queen taken away in the beginning, unless she is to be returned.

By this method the queens are mated from the hives in which they are to remain, and the beekeeper only needs to make sure that the colonies where the young queen fails to return safely from the mating trip are given another cell or queen. While this plan is simple and will serve all purposes where but a few queens are wanted, it is too slow for extensive use.

When large numbers of queen cells are wanted, artificial cells, made of beeswax and shaped as nearly as possible like an embryo queen cell are utilized. To begin with, a colony

is made queenless and permitted to start queen cells. From these a supply of royal jelly is secured. Royal jelly is a milky, jelly-like, substance which the bees feed freely to queens in the larval stage. This richer food and the larger cell are sufficient to enable a young larva from a worker cell to develop into a queen.

The brood is now taken from this cell-starting colony and given to another colony. The object of removing the brood is to relieve the nurse bees from brood rearing and to center all their attention on the rearing of queens. The beekeeper then takes a supply of the artificial cells which are attached in rows to an empty frame (Fig. 15). In each cell a small drop of royal jelly taken from the naturally built cell is placed. With a small instrument made for the purpose, a newly hatched larva is removed from a worker cell and placed in each of the artificial cell cups. The larva should not be more than twenty-four hours old, and

some of the best breeders advise the use of larvæ not to exceed twelve hours old. The frame is then placed in the middle of the hive

FIG. 15.—Queen cells produced by the cell cup method.

occupied by the queenless and broodless colony. A large part of the cells should be accepted and within twenty-four hours should be well built up. The cell-starting colony will

not be permitted to finish the cells, but they are taken away and placed in the middle of another hive which occupies two stories, with the queen in the lower story and an excluder between to

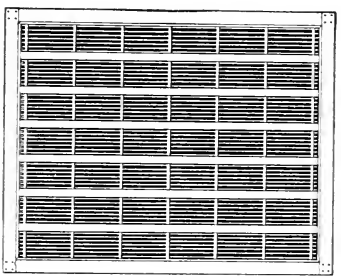

FIG. 16.—The queen excluder prevents the queen from passing into the super. The workers being smaller readily pass through the openings.

keep her from going above and destroying the cells which are placed in the upper story (Fig. 16). The first colony is then given another lot of cells to start. Only strong colonies should be used for cell starting or finishing, since the best queens are not produced in small colonies.

LATER TREATMENT.—While the worker bees require twenty-one days for development

from the time the egg is laid, as described in Chapter III, the queen completes her growth in only sixteen days. On the eleventh day after the young larvæ are placed in the cells the queens will be nearly ready to emerge and it will be necessary to remove the ripe cells from the finishing colony. If they are to be used to requeen an apiary at once, the simplest way is to place one in each colony to be requeened, twelve hours after the old queens are removed. If they are to be kept for a time, it will be necessary to provide nuclei for the purpose of getting them mated. Fig. 17 shows a very satisfactory one for this purpose. An ordinary hive has been divided into three separate compartments with the entrance to the middle one at one end, and an opening at each side for the outside ones. By this plan one hive serves for three and the bees are not able to pass from one apartment to another. In each, two frames of brood and bees are placed, without queens,

of course, and each is given one of the ripe cells. Usually the young queen will be mated and laying within two or three weeks from the time

FIG. 17.—Hive divided into three compartments for mating queens.

the cell is given. If the beekeeper wishes to mate a large number of queens and has a limited supply of bees, he can get along very well by placing one frame of brood and bees in each

nucleus and also giving an additional frame with some honey. The newly mated queen will soon begin to lay and the little colonies will gradually grow stronger if conditions are favorable. In this way one strong colony broken up into nuclei will furnish sufficient bees to care for six or eight queens.

Extensive queen breeders break up large numbers of colonies in spring to enable them to rear enough queens to supply their trade during the summer months, and they are again united in fall and wintered as full colonies. One firm was using fifteen hundred such nuclei at the time of the writer's visit and were sending out nearly ten thousand queens that season.

"Practical Queen Rearing," by the author of this book, gives an exhaustive account of the various methods of rearing queen bees both for home use and for commercial purposes.

CHAPTER XI

GETTING THE HONEY TO MARKET

In most cases the beginner will find his local market the best place to sell his crop. It is usually possible to develop a local market for a small crop at much better prices than could be realized by selling through commission merchants in a large city. The man who sells at home is able to get retail prices for much of his product and to save the amount that would otherwise be consumed in freights and commissions. The man or woman who expects to follow beekeeping as a business will make a great mistake if he fails to ask a good price for his product in the beginning. Too many are willing to sell their honey at retail, at the wholesale prices. This is a serious injury to the market and always tends to depress the prices. If one never expects to have much

honey to sell he should still have some regard for the rights of others and sell at a reasonable price. If one has anything to give away he may well do so, but should not injure his neighbor who depends upon honey production for a livelihood by cutting prices. Production of a commodity is one thing and selling it is quite another. If the producer chooses to market his product at retail he should get paid for the selling as well as the production of his crop.

Reaching the Distant Market.—On one occasion the writer made a journey to Chicago to see what could be learned about the marketing of honey through the large wholesale centers and also something of the best retail trade in a large city.

In order to learn as much as possible about conditions an effort was made to follow the honey from the producer to the consumer. This involved a study of the conditions of transportation by freight or express, a visit to the

wholesale district and to the retail stores which serve the best trade.

One point that soon became very apparent was that of the hundreds of commission firms on South Water Street only a few handle honey at all. There were hundreds of crates of cabbages, celery, sweet potatoes, oranges, apples, and other staple products to one case of honey. It did not take the writer fifteen minutes to decide that the trouble was not due to over-production.

After talking to a number of commission merchants who do not handle it at all as well as those who do, it began to look like the trouble was of quite a different kind. It looks very much to the writer like it is improper distribution and lack of incentive for the merchants to push our product. A merchant dislikes to establish a trade for a product which he is unable to supply. If even twenty per cent. of the commission merchants should undertake to

establish a trade in honey and should succeed to the extent that a few have done the supply would not last one-third the year. If a man orders honey from his grocer and is unable to get it, maple syrup or corn syrup will take its place and the next order will be for the substitute.

Some beekeepers are forever talking about overproduction and lack of demand. When corn flakes first appeared on the market there was no demand but the manufacturers proceeded to create a demand by extensive advertising and to fix the price at a point which would pay for their product and pay for the advertising in addition.

Competition is very keen, especially in the large market centers. One firm visited, handled three million dollars' worth of produce that year. This amount would make a pretty big hole in the honey crop for one season.

As it now stands there is no effort to supply

honey at all seasons of the year. The crop is moved as quickly as possible after it is harvested with the result that the market is either crowded with honey or bare. A dealer who would build up a trade must depend upon buying large quantities long in advance and anticipate the demand of his trade for several months. The honey producers seem to be in about the same condition that the orange growers were in 1895 before they perfected their marketing organizations.

Why Freight Rates are High.—To get back to the beginning, the first thing that confronts the honey producer who would send his honey to market is the matter of high freight rates. Too much care cannot be taken in packing honey for shipment, not only to guard against damage in shipment but also to keep the number of broken packages down to the point which will enable the railroad to carry honey at a low rate and still make a profit. Too

many beekeepers take the attitude that it matters very little, for in case the shipment is damaged in transit the railroad company will pay for it anyway. This is a mistaken viewpoint. Claims for damages are a part of the regular expense account of the railroad company and when the damages absorb too large a part of the profits the rate is raised accordingly. It is not only the damage to the honey which results in a loss to the railroad but the damage to other goods which may happen to be in the same car with the broken package. As an example may be cited a case where a broken package of honey damaged a shipment of silk. The railroad had to pay for both the honey and the silk, the latter, of course, worth many times the value of the honey. In many cases the damage from broken packages could be avoided if the producer would use sufficient care in preparing his shipment. It is easy to see that in the end the entire loss must be borne by the honey pro-

ducer. The careful shipper must divide the expense with the careless one, since the freight rate is made high enough to cover all such losses in addition to the operating expenses of the railroad.

The writer was for a time engaged in the practice of law and never during the years when his time was so occupied did he find any difficulty in getting a fair settlement for a client for loss or damage in shipment by freight. Some railroads are much more prompt in payment than others, but all with whom we had any dealings seemed entirely willing to make good any loss for which they were responsible. There was never any necessity to start suit on cases of this kind, for once proper proof of loss was presented settlement was secured without difficulty. The attitude of the railroads seemed fair enough and if it were possible for them to get into touch with the shippers and make clear the difficulties under which they work there

would be much less friction because of high freight rates.

If the beekeepers desire to reduce freight rates, the first move to make is to educate the shipper to use more care in packing for shipment and thus reduce the amount of damage. If the careless man can be kept from shipping improperly crated honey there will be no difficulty in getting a reduction of freight rates on this commodity. Until then all honey shippers must contribute something to pay the losses.

Value of Attractive Packages.—When a man goes into the large markets and sees the large variety of products that are offered, he at once learns that in order to appeal to the consumer any commodity to be used for food must be offered in the most attractive form possible. The writer saw a very good example of that in one of the well-known commission houses when a retailer came in to make a purchase with which to supply his trade. There

was a liberal supply of extracted honey in sixty-pound cans on the floor of the warehouse. He examined the various lots with a good deal of care, sampling each lot two or three times to make sure that the quality was good. The thing that impressed the writer, however, was not the care this man used in looking for the best flavor, but that he refused to sample honey in rusty cans. There was one shipment in cans that were rusty on top and which had a rather unattractive appearance generally. He sampled honey only in bright new cans that did not show a particle of rust. When the writer asked the commission man about the difference in price he was informed that they were compelled to sell the honey in rusty cans at from one to three cents per pound less. In spite of the difference in price this buyer would not even look at it. Probably the shipper of that lot of honey will blame the commission merchant and charge him with stealing a dollar or

two per case on the shipment. It surely is a poor policy to save fifteen cents by using a second-hand can in which to ship the honey to market and lose from sixty cents to one dollar and eighty cents per can in making the sale. If the writer had not already been convinced of the value of new packages for honey this observation would have convinced him.

However, another example was in store, with comb honey this time. The honey was well graded and in new shipping cases, but seconds had been used which showed dark streaks of wood instead of the clean white of the first quality shipping cases. This was on the floor of another store so that the two examples did not occur in the same establishment. Although the honey was of about the same quality, the more attractive package sold for fifty cents more per case than the other. Someone had bought inferior cases and had probably saved a few cents in the price, but it cost two cents

per pound in the selling price of the honey. The producer who must sell in a distant market should insist on the best possible quality in shipping cases, and before placing an order for supplies should know that the quality is O. K.

In this establishment the writer was shown a model shipment of comb honey. The grading was remarkably uniform, the sections were perfectly cleaned and the cases as clean and white as one could wish. This honey was selling at the highest price the market would afford.

ATTRACTING THE CONSUMER.—After noting the great advantage that attractive packages had in wholesale sales the writer was more interested than ever in the retail package. Retail stores were visited in the best part of Chicago where the rents paid for space would make most of us gasp. These stores sell to high-class trade and they are as neat and clean as a parlor. The first one visited offered " Airline " honey. When asked if they handled no other kind they

replied that they did not. The writer then enquired whether it was because the public insisted on "Airline," owing to its advertising, that they handled no other. The reply was that it was because of the clean packages in which it was offered. The salesman then showed the comb honey in clean tight cartons, and the extracted jars wrapped in oil paper. There was no drip and every separate section or jar was as nice and clean as any other line which they had on their shelves. The public asked for "Airline" honey because of its advertising, but most buyers would as readily accept any other if equally attractive. This dealer handled "Airline" honey because it was clean and saved him the annoyance of dirty packages. The reason was clear enough and we went out to find a store that handled something else. We found it but a few doors away and the honey was the only sticky package that we found in that store. The extracted honey packages were sealed in the ordinary way and nearly

every one showed a slight drip down one side. This little streak of honey would catch all the dust and thus it soon became anything but attractive. The label was printed in only one color so that altogether there was no comparison in the appearance of the brands. Had the writer been in search of honey for his own table it is easy to guess which he would buy if he knew nothing of either producer. Furthermore, he left the store with the feeling that he had learned some lessons which he could utilize to good advantage in marketing his own honey crop. One does not have to look far to see that money spent in putting up our product in the most attractive package will come back several times over when we sell the crop.

Package Must Fit the Trade.—This brings us to another consideration; the kind of package in which to ship. This depends altogether on the trade to which the honey is to be sold. If to a buyer who will sell it again under his own trade name it should have no mark of

any kind excepting the net weight which the law requires. If, on the other hand, it is to be sold through some regular channel which recognizes the producer's trade-mark as an asset it should be labelled with the producer's own mark. In one warehouse there was a big pile of shipping cases marked "J. E. Crane & Son, Middlebury, Vt." One of the cases was opened and some of the sections removed. They were very nice and each was wrapped in a clean carton with the Crane name and the usual printed matter. The dealer remarked that he had been handling Crane honey for nearly thirty years. In this case the honey was known to the buyer and the name was a guarantee of quality. But a few weeks before the writer had asked for honey in the Boston market and had been shown a jar of extracted honey with the Crane label. There is no question but that it is greatly to the advantage of the seller to market his best product under his own trade name when he can do so. However, it often

happens that when he goes into a strange market the only buyers who will present themselves will be those who buy to sell again under their own name and such would not buy honey with the individual trade-mark. It is well to correspond with the commission merchant with whom one expects to deal and learn something of the market requirements. Some of the largest sellers of honey in the Middle West have a trade which they supply with comb honey in their own cartons and with each case they send a placard for advertising purposes. This trade has come to look for the brand. Honey sold to this trade is placed in the cartons and repacked after it reaches their warehouse. Of course, not all of the honey that passes through their hands is handled in this manner.

General Requirements.—The writer interviewed a number of dealers both wholesale and retail. When asked for some general advice to the honey seller they agreed on the following:

Sell through a firm that specializes in honey, for such a firm can get a better price. Be very careful about grading and packing and use corrugated paper lining for the shipping cases to catch drip. All agreed that in general comb honey sells better in bright wood shipping case with glass, than in corrugated paper cases, and usually arrives in better condition.

The railroad claim agents gave the following advice in regard to shipping: Use only factory-made shipping cases and load the honey so that the combs will be parallel with the rails. This will place the shock of shipment on the edges instead of face of combs. Use cement-coated nails since they hold better, and use cushioned carriers. Stencil name and address on the package instead of using a shipping tag put on with tacks. Tags often get rubbed off and the shipment goes astray while the stenciled address cannot be lost. Also avoid as far as possible the shipment of comb honey in cold weather.

CHAPTER XII

ENEMIES AND DISEASES OF BEES

THERE seems to be no agricultural pursuit free from the disorders common to life in general. While many localities are free from disease, the beekeeper may have reason to expect its appearance sooner or later. While in tropical regions of many countries there are many enemies of the bees which may destroy whole apiaries, the temperate regions of the United States are free from serious danger on this score. The waxmoth is widely distributed and among amateurs generally feared. While it may destroy the combs of weak colonies, the waxmoth will not injure strong colonies, nor is there any animal known to the writer whose presence may endanger the success of his business.

MICE frequently cause injury in winter

where the entrances of the hives are left wide open. All entrances should be contracted to not exceed three-eighths of an inch in height during the winter months to prevent the entrance of mice. These little animals also often damage combs that are stored in outbuildings or other situations within their reach. All unused combs should be protected from both mice and moths.

Skunks occasionally become troublesome by scratching at the entrance of a hive and devouring the bees as they rush out. Since they return to the same hive night after night, it is not usually difficult to catch the offender with a steel trap.

Waxmoths are the source of great anxiety to most beginners. As soon as a colony is lost from any cause, the moths will enter the hive and deposit their eggs. The larvæ burrow through the combs and soon destroy them. If a colony becomes weakened the moths are quite

likely to destroy the combs, and thus hasten the end. However, the presence of moths may be regarded as a sign that all is not right, at least with the colony affected. If disease is present in the apiary, the colonies that become weakened by its ravages will fall easy victims to the moths. Queenless colonies or those whose condition is not normal from any reason, are the ones to be affected. Strong colonies easily defend themselves against the pest, so that the beekeeper who keeps close watch and knows that his bees are in good condition, seldom has any anxiety on account of waxmoths.

Diseases of Bees.—There are several different diseases known to affect the honeybee. The diseases of the adult bees are not well understood as yet. It is not definitely known how many there are, or what the cause may be, but it is quite probable that there are several distinct diseases of the adult bees.

Paralysis is the name by which we most often hear of disease of the mature bees. It

usually appears in spring. The affected bees appear black and shiny and they may be seen in front of the hive apparently unable to fly. At times the abdomen is distended. Bees also sometimes suffer from dysentery, which is probably caused by poor stores or too long confinement to the hive.

FOULBROOD, of which there are two kinds, is the most serious disease with which the beekeeper has to contend in America. However, both forms are now so well understood that the well-informed beekeeper no longer fears them as he once did.

Both American and European foulbrood are diseases of the larvæ, and although they have well-defined differences, the novice would seldom be able to distinguish between them. If the brood is found to be dead without some apparent cause, it will be well for the beekeeper to cut out a piece of the comb containing some of the dead larvæ and send it to the Bureau of Entomology of the United States Department

of Agriculture, at Washington, D. C. Such samples will be examined by an expert and the beekeeper informed as to the nature of his trouble without expense to him. It is important that the particular disease which may be present be early determined, as the kind of treatment necessary will depend upon which disease is present. In the case of American foulbrood it will be necessary to remove the bees to a clean hive and deprive them of all their brood and honey. The contamination seems to be spread in the honey with this disease. If the disease is European foulbrood it will be necessary to check brood rearing for a time, and to requeen with a resistant strain, preferably Italian.

Sacbrood is a disease somewhat resembling those just described. It is milder in form and frequently disappears of itself during a honey flow. The author usually requeens colonies found to be affected with this disease and this is usually sufficient.

CHAPTER XIII

WINTER PREPARATION

THE novice who plans to keep but a few bees will do well to buy some of the double-walled hives now on the market, and thus reduce his winter preparation to the minimum. The ordinary single-walled hive provides insufficient protection in any of the Northern States and it is quite probable that the bees would be better for some extra protection in most of the Southern States. With the double-walled hive it is but a matter of a few minutes at the time of the last summer examination, to put the chaff tray in place over the frames, contract the entrance with the entrance blocks, replace the cover, and the job is done. No further attention needs to be paid to them, except to see that the entrances do not get clogged with ice during winter storms, until time to make the spring examination. In cold climates additional protection should be given.

PRELIMINARY PREPARATION FOR WINTER. —After the close of the honey flow the bees should be prepared for winter as early as possible, to avoid disturbing the colony after the normal activities of summer have ceased. Care must be taken to insure plenty of honey to last the bees through the long months when no honey comes to the hive. In the Northern States it is seldom safe to depend upon less than thirty pounds, and the author prefers forty to fifty pounds of sealed stores. This large amount will insure a sufficient supply for early brood rearing and will carry the colony safely through an unfavorable spring. The quality of the stores is important, especially in the North, where long periods of time elapse when the bees are unable to leave the hive to get a cleansing flight. The bees relieve themselves of the accumulated excrement only while on the wing, under normal conditions. If the stores be of poor quality, such as honeydew or im-

properly ripened honey, the long confinement is very hard on them and they often become affected with dysentery, soiling their combs and putting the hive in a filthy condition.

Large clusters of young bees are also essential to successful wintering by any method. If the hive is full of old bees that have gathered the fall harvest, they will die before spring and the colony will perish. If the honey flow continues late, plenty of young bees will emerge late in the season to put the colony in prime condition for wintering. Old and failing queens will often fail to continue laying during the late summer and the colony will become greatly weakened, if it does not die before spring. Colonies known to have young queens will usually be in good condition unless there is a dearth of nectar during the fall months. At such times it is often necessary to feed lightly for a few days to stimulate brood rear-

ing, preparing the colony to go into winter quarters in proper condition.

Given the above described conditions, young queens, plenty of good stores, and a large cluster of young bees, a colony will stand a surprising amount of cold weather and come through in fine shape.

Protection for Winter.—As to whether outdoor or cellar wintering is best is not a matter of agreement among beekeepers. Both methods are generally practiced and there are those who feel very sure that one is best while others are equally sure the other will bring better results. Bees can be safely wintered by either method if proper attention is given to see that conditions are right. As stated at the beginning of the chapter, the writer would recommend double-walled hives, under ordinary conditions, to the person who has but a few colonies to care for. They would hardly be sufficient protection for the extreme north, but

for most of the United States they will bring very good results if other conditions are right. Additional packing can be given where needed.

CELLAR WINTERING has its advantages. The cellar should be dry and of a uniform temperature. A cellar that is warm during mild weather and cold when the thermometer drops, should never be used for the bees. The cellar should also be dark, as the bees will get restless in a cellar which is sufficiently warm, if the light enters during the day. For best results the temperature should not drop below forty degrees, and most of the time should stand about fifty degrees Fahrenheit.

The bees should be placed in the cellar as soon as settled cold weather begins, and left there until danger of severe weather is past in spring. It is better to take them in a little early and to remove them a little late than to err in the other direction.

PACKING OUTSIDE.—Various plans of pro-

viding extra protection to the hives on their summer stands have been used. The best plan is to use some kind of packing box outside the hive and fill the space between the hive and the box with leaves, planer shavings or some simliar material. When bees are packed in this manner provision must be made to leave the hive entrance open so that the bees can fly out on warm days and return again to the hive.

If but a few hives are to be packed it is an easy matter to make such cases of goods boxes. If the beekeeper plans to operate extensively, special packing cases should be made that are of uniform size. The most widely used packing case holds four colonies with two facing east and two to the west. F. W. Krouse of Ontario is an extensive beekeeper who has a separate packing case for each colony, and leaves them in place the year round. This gives ample protection against the changing weather of spring and fall, as well as winter.

CHAPTER XIV

REVIEW OF THE SEASON'S WORK

It is difficult in a book of this kind which must be adapted to all parts of America to give a detailed chart for the operations necessary at different seasons of the year. The time of the principal honey flow varies so much in different localities that no time can be set for any operation. The whole year's work is planned with the one object in view of bringing the colony to the beginning of the main flow with as many bees as possible. The big colonies gather the big crops, and the beekeeper carries his work through the year so as to bring the colony to maximum strength at this time.

Whether the beekeeper lives in Maine or California, there are certain essentials which must be considered. One of these is to supply the bees with sufficient stores at the close of

the season to carry them through the winter months and to furnish a reserve for building up the following spring. If the bees must depend upon stores gathered from the field at this uncertain season much of the productive possibility of the colony is likely to be lost. It is only in the presence of a liberal reserve of food within the hive that the queen is likely to lay to her capacity in the cool and catchy weather of early spring. Especially is this true when little nectar is coming from the fields

Accordingly, when the bees are removed from winter quarters, the first thing necessary is to make sure that an abundance of stores are still present to enable the bees to build up rapidly. It takes a liberal supply of honey to rear the amount of brood necessary to make a strong colony, and one of the first essentials of good beekeeping lies in never allowing the colony to become short of stores.

At the first examination, the general condi-

tion of the colony should be noted. Not only should the beekeeper make sure that the supply of stores is sufficient, but he should ascertain whether or not a queen is present and in good condition. It sometimes happens that some colonies will be very weak at this season of the year, and, unless given some help, will be lost. Such weaklings may be helped by giving them a frame of sealed brood from a strong colony. It is unwise to give very weak colonies unsealed brood, since they are unable to care for it properly. If the cluster is too small, it is often better to unite them with some other colony than to try to build them up. Very weak colonies can sometimes be saved by removing the cover from the hive containing a strong colony and in its place covering the hive with ordinary wire screen. The bottom of the hive containing the weak colony is then removed and the hive placed directly on top of the strong one. A hole to enable the bees to fly from the upper

body should be made on the end opposite the entrance to the strong colony. The bees above will get the advantage of the heat ascending from the strong cluster below, while there is no chance for the bees to pass through the wire cloth and thus unite the two clusters. After the bees in the upper hive have recovered their strength sufficiently to enable them to care for their brood properly, they may be set off again on their regular stand.

ROBBING.—In early spring when there is little to be had from the fields and some colonies are still weak, there is always danger of robbing. The bees from the strong colonies will fly around the openings of other hives until they find a suitable opportunity, and then come in such numbers as to overpower the rightful owners and carry off their honey. The best prevention is to contract the entrance to a very small space so that but few bees can pass at one time. All other cracks should be tightly

closed. This will make it possible for the guards to protect from prying bees from other hives. If robbing once gets started it is likely to continue until the honey is all removed from the hive of the victims. Such a condition often leads to a general furore in the apiary, when one hive after another is robbed until many colonies are ruined. The beekeeper should always be on guard against robbing, as prevention is far better than cure.

If robbing has started it is easy to determine the colony which is doing the mischief by dropping flour on the bees as they leave the hives with their stolen plunder. At the beginning there is likely to be only one or two hives making mischief. When the trouble makers are located, to change places of the robbed colony with the one which is doing the robbing will often stop the trouble. Both entrances should be made smaller until only one bee is able to pass at a time.

The beekeeper should never leave bits of honey in the open where the bees can find access to it, as this often starts robbing. When the bees find honey exposed at a time when no nectar is coming from the fields, it starts them seeking out every crevice in the vicinity in search of a larger supply, and much trouble is likely to result.

PREPARING FOR THE CROP.—Aside from making sure that the bees are in good condition, have a suitable supply of honey and proper protection; there is not much to be done in early spring. Supplies should always be ready in advance so that when the crop season arrives there will be no delay.

Care should be used to see that room is added as fast as needed. When the brood chamber becomes crowded it is time to give super room. If, when the cover is removed, the hive seems to be overflowing with bees and the combs are being whitened at the tops of the

frames, it is safe to assume that more room is necessary. When the bees are found to be working in the supers, close watch should be kept to make sure that additional room is added as fast as the bees are ready to occupy it. Many beekeepers fail to get a satisfactory crop simply because they fail to provide the bees a place to put it in time. During a good honey flow they will often fill a super in a very few days and, under favorable conditions, will often fill two to five supers before the first one is ready to be removed from the hive. The honey should be left with the bees until it is well capped over. If removed from the hives before it is properly ripened, the quality is likely to be poor. Where the beekeeper waits till one super is filled and removed before giving another, he is likely to lose the larger part of his crop in a good season. A strong colony will have more bees than can work in such a small space, and it requires some skill to determine how much room is necessary to secure the maximum yield,

without scattering the honey too much. This is especially true of comb-honey production.

Removing the Honey.—When the supers are filled it is an easy matter to place those which are to be removed on top and place a bee's escape board underneath, between the filled super and the ones below. In a few hours the bees will have gone below and not being able to return the super can be removed, free from annoyance.

Closing the Season.—When the honey flow is over, the surplus honey should be removed from the bees as soon as possible. The preparations for winter should be made early in the fall, so as not to disturb the bees any later than necessary after active operations are over. At this season it is important to replace any old and failing queens with vigorous young ones, to replace the queen in colonies where the stock is undesirable for any reason, and to make sure that an abundant supply of honey is present to carry the bees through till

the following season opens. Many beekeepers make a practice of leaving a super of extracting combs on the hive for a reserve supply, in addition to the honey in the brood nest.

Where the bees are wintered outside, the necessary packing should be done early. It is better to pack late than not to pack at all, but there is a decided advantage in favor of finishing the winter preparations as soon as convenient after the nights begin to be frosty.

All of the beekeeper's activities center in the queens which head his colonies. Without good queens no matter how careful the management there can be no satisfactory degree of success. Given vigorous young queens, the other essentials are not many. Mr. George Demuth of the U. S. Department of Agriculture sums up as follows: stores, room and protection. Given plenty of stores, an abundance of room for colony activities at the proper time, and suitable protection, success is assured.

GLOSSARY

Absconding. A term commonly used where swarms are lost through their departure for parts unknown.

Adair Hive. A hive formerly popular in some localities but now almost gone out of use. The frames were 13⅜ inches long and 11¼ inches deep.

Afterswarm. A small swarm issuing after the first or prime swarm. Where bees are not given proper attention it is not uncommon for them to send out several afterswarms, one after another until the parent colony becomes almost worthless.

American Hive. A hive once common but now seldom seen. The frames were 12 inches square.

Apiary. A place where bees are kept. As generally used the term includes bees, hives and other equipment together with the situation.

Apiculture. The pursuit of beekeeping.

Baby Nucleus. A small colony of bees for the purpose of mating queens. Queen breeders often break up colonies into small parts, placing a pint or so of bees into each small hive. To each is given a ripe queen cell.

Balling Queens. When a strange queen is introduced to a colony or when some abnormal condition incites the bees to mistrust their own queen, they often cluster about her in a dense ball, thus smothering her.

Beebread. A term commonly used for pollen stored in the cells within the hive.

Bait Sections. Comb honey sections in which comb left over from a former season has been built. These are placed in the supers along with those filled with foundation to induce the bees to begin work in the super more readily.

Banat Bees. A dark race of bees coming from Hungary.

Bar Hive. A hive with bars instead of frames. These hives are commonly used in Europe but seldom found in America.

Bee-escape. A contrivance which enables the bees to leave a compartment of the hive but prevents their return.

Bee Gum. A name commonly given to a hive made from a portion of a hollow tree. In the South, gum trees are commonly hollow and these are so often used for hiving swarms, that the term has

come to apply to any kind of box or hive in which bees are kept.

Bee Martin. The common Kingbird, (*Tyrannus tyrannus*).

Beemoth. The waxworm. The adult is a small grey moth which lays its eggs in or about the hive. The young larvæ burrow in the combs, feeding on the wax and pollen, and in time destroy the combs unless checked.

Beepasture. Sources of nectar. The flowering plants on which bees feed.

Beespace. A space large enough to permit the free passage of the bees, but not large enough to permit the building of the comb. About ¼ inch.

Black Bees. The common bees of Europe. The German Bee.

Bottom-board. The floor of the hive.

Box-hive. A hive without frames. A box in which bees are hived.

Brood. The young bees in the larval stage.

Brood-chamber. The lower portion of main body of the hive. The part containing the brood nest.

Brood-comb. A comb used for brood rearing.

Brood-frame. A frame containing a brood-comb.

Brood-nest. The part of the hive where the colony makes its principal cluster. The place where the eggs and larvæ are to be found.

Brood-rearing. The rearing of young bees.

Bulk Honey. Honey cut from the frames and marketed in bulk as distinguished from extracted honey or honey in sections. Also spoken of as chunk honey.

Burr-comb. Burr-combs or brace combs are small bits of comb built into small spaces, between two combs, or between the frames and other hive parts.

Capping Melter. A container made of metal which is heated to melt the cappings as they are cut from the combs in extracting honey.

Carniolan Bees. A race of dark bees, native to the province of Carniola, Austria.

Caucasian Bees. A race of dark bees native to the Caucasus.

Cellar Wintering. The wintering of bees in a cellar as distinguished from wintering on their summer stands, out of doors.

Cells. The hollows in the combs in which honey is stored. These are of two sizes; worker cells, which measure about twenty-seven to the square inch and drone cells, which measure about eighteen to the square inch. They are hexagonal in shape and the bottom of each cell is opposite one third of each of three others on the opposite

side of the comb. Queen cells are special cells resembling peanuts which are built for the rearing of the queens.

Cell-cup. An artificial cell base made of beeswax used by queen breeders to serve as queen cell.

Cell-Protector. A spiral covering made of wire placed over ripe queen-cells to prevent the bees from destroying them when placed in a strange hive.

Chunk-honey See Bulk Honey.

Cleansing Flight. Since bees do not void their excrement in the hive, but only on the wing, except when diseased, it is necessary for frequent flights to relieve them of the accumulated fæces. A cleansing flight is the first flight after a period of confinement.

Cluster. The normal gathering together in a compact mass. In clustering, the bees hang together by means of the hooks on their feet. The winter cluster is formed when the temperature drops to 57 degrees Farh. When the swarm emerges, a cluster is formed on a twig or other convenient object. A cluster is formed within the hive for the purpose of maintaining sufficient heat for brood rearing. According to Phillips, brood rearing temperature rarely exceeds 97 degrees.

Chaff Cushion. A cushion filled with chaff or other absorbent, which is sometimes placed over the frames for the purpose of absorbing condensed moisture in cold weather.

Colony. A hive of bees, including bees, eggs, brood, etc., together with combs and equipment.

Comb. The assembled hexagonal cells built of beeswax in one frame by the bees. A honey-comb.

Comb-Foundation. A sheet of beeswax impressed with the exact size and shape of the bases of the cells used by the bees.

Comb-honey. Honey in the comb. Usually applied to honey in sections.

Cyprian Bees. A yellow race of bees native to the Island of Cyprus.

Dadant Hive. A large hive with eleven frames $18\frac{1}{2} \times 11\frac{1}{4}$. The frames are spaced $1\frac{1}{2}$ inches from center to center and a dummy is used to reduce the size of the hive for weak colonies. A straw mat is used over the frames when supers are not in place.

Dadant System. A system of extracted honey production by means of the large Dadant hive. The deep frames and wide spacing reduces the amount of manipulation necessary for ordinary operations and largely controls swarming.

Danzenbaker Hive. A small hive with frames 7½ x 17 inches. It was very popular for a time but is going out of use.

Decoy Hive. A hive placed in a favorable situation for the purpose of attracting stray swarms.

Dividing. Separating a colony into two or more parts for the purpose of making increase.

Divisible Hive. A shallow hive. See Heddon Hive.

Division-board. A board made of light material, the same size as a frame, which hangs in some hives the same as a frame. The idea was that by first removing the division board extra room would be available for manipulating the frames. The device is unpractical and has been discarded by most bee-keepers. See Dummy.

Drifting. When bees are taken from the cellar in spring they often become confused when taking their first flight, and large numbers drift to the strong colonies, thus leaving others greatly weakened. The tendency to desert their own hives for those of stronger colonies in early spring.

Drone. The male bee.

Drone-brood. Young male bees in the larval stage.

Drone-comb. Honeycomb with cells averaging about eighteen to the square inch. Comb in which young drones are reared. See Comb.

Drone-layer. An imperfectly fertilized or unfertilized queen. One whose offspring are all males.

Drone-trap. A trap made of perforated zinc or wire placed at the entrance of the hive. The worker bees pass through the perforations but the drones, being larger, are caught.

Drumming. In transferring bees from boxes or unsatisfactory hives, the exit of the bees is often hastened by drumming or pounding on the sides of the old hive.

Dummy. A division board made like a frame, excepting that it fits tight at both ends. It is used in the Dadant hive in place of a comb for the purpose of contracting the size of the hive for wintering or for encouraging weak colonies.

Dzierzon Theory. The theory of parthenogenesis; that an unfertilized or unmated queen can still lay eggs which will produce male offspring.

Eight-frame Hives. The Langstroth hive of small size holding only eight instead of ten frames.

Entrance Block. Small blocks of wood used for reducing the size of the entrance to prevent robbing or reduce the exposure to the weather.

Entrance Guards. Sheets of perforated zinc placed across the entrance to prevent the escape of the queen when a swarm issues.

Egyptian Bees. Yellow bees native to the Nile Valley.

Equalizing Brood. Taking brood from strong colonies to give to those which are weaker for the purpose of making all colonies equally strong.

Excluder. A contrivance made of perforated zinc or wire which prevents the queen from passing into the supers. The workers, being smaller, readily go through the perforations.

Extracted Honey. Honey removed from the combs by means of an extractor.

Extracting Combs. Combs from which the honey is removed by means of an extractor.

Extractor. A machine for removing the honey from the comb. It consists of wire baskets which revolve within a large can. After the combs are uncapped they are placed in the baskets and the centrifugal motion throws the honey against the side of the can. It is drawn off by a faucet at the bottom.

Fanning Bees. In warm weather a number of bees may be seen at the entrance of the hive, fanning with their wings for the purpose of creating air currents to ventilate the hive.

Fertile Workers. In queenless colonies it often happens that some of the worker bees begin to lay. Their eggs are scattered about in a very irregular manner. Being incapable of mating only male offspring results, and the colony is therefore doomed.

Forage. The flowering plants from which the bees gather nectar.

Foulbrood. Foulbrood is of two forms, American and European, named from the countries where first recognized. Both diseases attack the young bees in the larval stage and are very disastrous in neglected apiaries.

Foundation. See Comb Foundation.

Frames. The containers in which combs are built. The invention of the frame made beekeeping a commercial possibility. Rev. L. L. Langstroth of Ohio was the first to devise a successful frame for the beehive.

Gallup Hive. A hive with square frames 11¼ inches each way. It is no longer generally used.

German Bees. The common bees of Europe, also called Black Bees. They were the first race introduced into America and for many years were the only race known here.

Grading Rules. Rules by which honey is graded for market.

Goldens. Bright yellow Italian bees of a strain which have been selected for their bright color.

Granulation of Honey. The candying or sugaring of honey. Most honeys will candy when subjected to frequent changes of temperature. It can readily be restored to the liquid state by placing the container in a tank of warm water or in any warm place. Care must be used not to overheat and thus spoil the flavor.

Green Honey. Honey which has not been sufficiently ripened, and which still contains a large percentage of moisture.

Gum. See Bee Gum.

Heddon Hive. A very shallow hive with frames $5\frac{3}{8}$ x $18\frac{1}{16}$ inches which created a great deal of discussion at the time of its introduction. It was also known as a divisible brood-chamber hive.

Hoffman Frame. The standard Langstroth frame with the addition of a self spacing feature. The end bars of the frame are cut wide enough to insure proper spacing at $1\frac{3}{8}$ inches from center to center. A metal spacer is sometimes used in similar manner.

Hivestand. The base on which the beehive is placed.

Holy Land Bees. The native bees of Palestine, also known as Syrians. They are similar to Italians in appearance but have whiter fuzz rings on the abdomen.

Honey. The evaporated nectar of flowers, as stored in wax cells by the honeybees.

Honey-board. A board placed between the hive-body and the super. Sometimes an excluder is called a honey-board, and sometimes the board containing the bee-escape is designated by this term.

Honeycomb. The assembled waxen cells built by the bees for the storage of honey. See Comb.

Honeydew. A sweet substance produced by aphides. The term is also applied to sweet exudations of plants not the product of true nectaries.

Honeyflow. When nectar is coming to the hives freely from the fields, it is spoken of as the honeyflow. The time when honey is abundant.

Honey-gate. The faucet by which the honey is drawn from the extractor.

Honey-house. The building at the apiary where honey and beekeeping equipment are stored, and which serves as a workshop for the beekeeper.

Honey-sac. The honeybag or sac in which the bees carry the nectar from the field. It is also known as honey-stomach.

House-apiary. An apiary kept entirely within a building erected for the purpose. The bees find their way to the outside through entrances through the wall from each hive.

Hybrids. The term hybrid is used to indicate a cross between two races of bees. The worker bees which are the offspring of a mismated queen are called hybrids.

Italian Bees. Yellow bees native to Italy.

Italianizing. Replacing ordinary queens with queens of the Italian race.

Inspector. A public official whose duty it is to examine bees for foulbrood and to make sure that proper treatment is given.

Langstroth Hive. The standard hive in America. The frames are 17⅝ x 9⅛ inches in size.

Larvæ. The young bees after hatching from the egg and before entering the pupal stage.

Laying Workers. Worker bees which lay eggs. See Fertile Workers.

Locality. The environment of the apiary. The term is used with particular reference to the available pasturage and the conditions that may be peculiar to a particular neighborhood.

Long Idea Hive. A hive used by the late O. O. Poppleton, which used no supers but contained a sufficient number of frames to permit of removing surplus honey from the hivebody.

Mating Hive. A small hive in which a small colony is kept for the purpose of getting queens mated. It is used by queen breeders who wish to secure as many queens as possible for the market. One large colony can be broken up into several parts, and thus serve to enable the breeder to increase the number of queens. See Baby Nucleus.

Mandibles. The jaws of an insect which work sidewise.

May Disease. A disease attacking adult bees in the spring of the year.

Midrib. The septum of the honeycomb.

Miller Cage. A queen cage invented by Dr. C. C. Miller.

Mismated Queen. An impurely mated queen. A queen of one race that has mated with a drone of another race.

Moth-Miller. The waxmoth. See Beemoth.

Mother-Bee. The queen.

Movable Frame. A loose frame which enables the beekeeper to examine any part of the interior of the hive at his pleasure. This term is used to distinguish such a hive from the box or skep

Nectar. The sweet liquid secreted by flowers which the bees elaborate into honey.

Nectaries. The glands which secrete nectar.

Neuter. A term sometimes applied to worker bees and also to ants which are not developed sexually.

Nucleus. (Plural nuclei.) In breaking up a strong colony into several parts, one, two or three frames of brood with adhering bees are taken away and placed in a separate hive. Each division is given a queen or ripe cell. These are spoken of as one-frame nuclei, two-frame nuclei or three-frame nuclei, as the case may be.

Nurse Bees. The worker bees which feed the larvæ. The newly emerged bees usually render this service, while older ones go to the fields.

Observation Hive. A hive with glass walls which permit the beekeeper to observe the actions of the bees.

Ocelli. The simple eyes of the bee, three in number and situated between the prominent compound eyes.

Outapiary. An apiary situated at a distance from the beekeeper's home. Commercial beekeeping is usually carried on by means of a series of outapiaries two or more miles apart.

Outyard. The same as outapiary.

Overstocking. The stocking of a locality with more bees than the forage present will support profitably.

Package Bees. Bees shipped in packages without combs.

Parent Colony. A colony from which a swarm has issued.

Parthenogenesis. The production of offspring by an unfertilized or unmated female. In the case of the bee, unmated queens and sometimes workers, lay eggs which produce drones. See Dzierzon Theory.

Pickled Brood. A mild disease attacking the larvæ. Sacbrood.

Piping Queen. The notes made by a young queen usually very soon after emerging from the cell and often in response to similar notes made by one not yet out of the cell. The sound made within the cell is called quahking.

Pollen. The fertilizing dust grains of plants. This is used by the bees as food for the larvæ. A reserve supply is stored in the cells within the hive.

Pollen Basket. The cavity on the hind leg of the worker bee where she deposits pollen to be carried from the field to the hive.

Pound Packages. Packages in which bees are shipped without combs. These are of various sizes from one pound capacity upward.

Prime Swarm. The first swarm to issue from a colony. See Afterswarm.

Propolis. A gummy substance or glue which the bees gather to close up crevices within the hive.

Punic Bees. See Tunisian Bees.

Pupa. The third stage in the transformation of an insect. The period during which the young bee is sealed up within the cell and receives no food.

Quahking. The sound made by a young queen before she emerges from the cell. See Piping.

Queen. The mother-bee. A sexually developed female honeybee.

Queen-cage. A small cage for the purpose of confining queen bees.

Queen-cell. The cell in which the young queen is reared. It is larger than other cells and of a different shape, resembling a peanut.

Queen Clipping. The wings of the queen are often clipped to prevent her escaping with a swarm.

Queen-excluder. See Excluder.

Queen Failing. A queen which is no longer capable of laying the usual number of eggs. An old queen.

Queen Introduction. The introduction of a queen bee to a strange colony. A strange queen will seldom be accepted. See Balling Queens.

Queenless. A condition where no queen is present in a hive.

Queen-trap. A trap for the purpose of preventing the escape of a queen with a swarm. See Drone-trap.

Queenright. The normal condition of a colony with a laying queen present.

Quinby Hive. The original large hive with deep frame, 18½ x 11¼. inches in size.

Requeening. The replacing of one queen with another. Beekeepers make a practice of requeening at intervals to insure good stock.

Ripe Cell. A queen-cell containing a young queen ready to emerge.

Ripe Honey. Honey that has been left in the care of the bees until the moisture is evaporated and it is of a sufficient density to keep indefinitely without spoiling.

Robbing. The taking of the honey from one colony of bees by bees from other hives.

Royal Jelly. A thick, white paste fed by the bees to the young. It is given in special abundance to young queens.

Sacbrood. A mild disease attacking the larvæ. It somewhat resembles foulbrood, but is not as malignant. It often disappears of itself without special treatment. Pickled brood.

Sections. Small containers made of wood of the right size to hold one pound of comb honey when completely filled.

Sealed Brood. Brood which has been sealed over. Young bees in the pupal stage of transformation.

Separator. A thin sheet of wood or other material used

in the super to separate the rows of sections. It is designed to insure even filling of the section boxes.

Septum. The layer of wax between the two rows of cells composing a honeycomb. The middle of the comb.

Shake Swarming. The artificial making of a swarm by shaking the bees into a new hive and leaving them to begin anew, as a natural swarm must do.

Self Spacing Frames. The Hoffman frame which has the end bars wider, thus insuring that they will not be crowded too close together in the hive.

Skep. A hive without frames, made of straw.

Skeppist. A beekeeper who keeps bees in skeps.

Slumgum. The refuse that remains after the wax has been rendered from combs.

Smoker. An implement for controlling bees by means of burning some combustible material in a metal holder. The smoke is driven out by means of a bellows.

Spring Dwindling. The gradual weakening of a colony of bees until it is useless or dies in early spring. The cause is usually improper food or neglect during the winter months.

Starter. A narrow strip of foundation used in frames to insure that the bees will start the combs lengthwise of the frame, instead of building them naturally, in uneven or wavy lines.

Stimulative Feeding. The feeding of small amounts of thin syrup in imitation of a light honeyflow. Liberal feeding and done with it is considered better beekeeping except when it is necessary to create abnormal conditions in queen rearing.

Sting. The barbed appendage of the honeybee.

Straw Mat. A mat made of straw used over the frames in the Dadant hive.

Super. The part of the hive where surplus honey is stored.

Supersedure. When the bees replace their queen with a young one without attention on the part of the beekeeper, it is called supersedure.

Surplus Honey. Honey remaining to be removed over and above an amount sufficient for the bees.

Swarm. The natural division of the colony, whereby the old queen and most of the field bees leave the hive to found a new colony, leaving the young bees and a young queen or a queen-cell. The normal method of increase of the bee colony.

Swarm-box. A box covered with screen in which to confine shaken bees when making artificial divisions or stocking nuclei.

Syrian Bees. The Holy Land Bees. A yellow race native to Palestine.

Ten-Frame Hive. The standard Langstroth hive with ten frames.

Tested Queen. A queen that has been tested by observing her offspring to make sure that she has been purely mated.

Tunisian Bees. Black bees native to the North Coast of Africa. The Punic bees.

Uncapping Knife. A knife used for removing the cappings from the honeycomb in preparation for extracting.

Unripe Honey. Green honey. Honey containing an excess of moisture.

Unsealed Brood. Brood which has not yet completed the larval stage of development. At the end of six days after hatching the young larvæ complete their growth and their cells are sealed over.

Virgin. An unmated queen.

Wax. The material used by the bees in building their combs.

Wax Extractor. An implement for separating the wax from the slumgum in rendering combs.

Wax Worm. See Beemoth.

Wiring Frames. The placing of wires across the frames when putting in foundation, to support the combs later to be built by the bees.

Wax Pockets. The receptacles between the segments on the under side of the abdomen of the worker bee where the wax scales are produced.

Worker. An imperfectly developed female bee. The neuter. In every hive there are thousands of workers which perform all the labor of the colony.

Worker-comb. Honeycomb containing cells of the size for rearing worker bees.

Wedding Flight. The queen's mating flight.